DOCUMENT RESUME

ED 107 024 EC 072 506

TITLE	Hearing Levels of Youths 12-17 Years, United States. National Health Survey Series 11, No. 145.
INSTITUTION	National Center for Health Statistics (DHEW), Rockville, Md.
REPORT NO	DHEW-HRA-75-1627
PUB DATE	Jan 75
NOTE	92p.
AVAILABLE FROM	Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 ($1.45)
EDRS PRICE	MF-$0.76 HC-$4.43 PLUS POSTAGE
DESCRIPTORS	*Adolescents; Age Differences; *Aurally Handicapped; Exceptional Child Research; Geographic Regions; *Hearing Loss; *Incidence; National Surveys; Parent Influence; Racial Factors; Sex Differences; Socioeconomic Status; *Statistical Data

ABSTRACT

The report of the National Center for Health Statistics presents national estimates of the hearing levels of youths 12-17 years of age in the civilian noninstitutionalized population of the United States. These are based on individual, monaural, puretone, audiometric test results of eight frequencies as obtained in the Health Examination Survey of 1966-70 for a national probability sample (N=6,768) representative of the 22.7 million youths in that segment of the population. Age, sex, race, region, urban-rural, income, and parent-education differentials in hearing levels are assessed. Major findings summarized from the study among youths include: that for their better ear more than half had hearing thresholds below (better than) the American Standard Association (ASA) 1951 standard for audiometric zero at all frequencies tested except 6000 Hertz; that hearing levels for girls are generally lower (better) than among boys, by mean differences large enough to be statistically insignificant at 2000-8000 Hertz; that the prevalence of hearing handicap as estimated from the puretone audiometric test results in this survey is quite low (only about 1.5 percent, or an estimated 281,000 youths 12-17 years of age in this country, have some degree of hearing handicap); and that youths from families with less than $5,000 per year had higher mean thresholds (poorer hearing) than those from families with income of $5,000 and over. (Author)

ED107024

Data from the
NATIONAL HEALTH SURVEY

Series 11
Number 145

Hearing Levels of Youths 12-17 Years

United States

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

Distribution of monaural hearing levels of youths 12-17 years at frequencies of 250, 500, 1000, 2000, 3000, 4000, 6000, and 8000 Hertz as determined in individual air-conduction tests, by age, sex, race, geographic region, size of place of residence, family income, and education of parent.

EC 072 506

DHEW Publication No. (HRA) 75-1627

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service

Health Resources Administration
National Center for Health Statistics
Rockville, Md. January 1975

Series 11 reports present findings from the National Health Examination Survey, which obtains data through direct examination, tests, and measurements of samples of the U.S. population. Reports 1 through 38 relate to the adult program, Cycle I of the Health Examination Survey. The present report is one of a number of reports of findings from the children and youth programs, Cycles II and III of the Health Examination Survey. These latter reports from Cycles II and III are being published in Series 11 but are numbered consecutively beginning with 101. It is hoped this will guide users to the data in which they are interested.

Library of Congress Cataloging in Publication Data

Roberts, Jean

Hearing levels of youths 12-17 years, United States.

(National Center for Health Statistics. Data from the National Health Survey, series 11, no. 145) (DHEW publication no. (HRA) 75-1627)

Bibliography: p.

1. Hearing—United States—Statistics. 2. Youth—United States—Health and hygiene—Statistics. 3. United States, Statistics, Medical. I. Ahuja, Elizabeth, joint author. II. Title. III. Series: United States. National Center for Health Statistics. Vital and health statistics. Series 11: Data from the National Health Survey. Data from the health examination survey, no. 145. IV. Series: United States. Dept. of Health, Education, and Welfare. DHEW publication no. (HRA) 75-1627. [DNLM: 1. Hearing—In adolescence. 2. Hearing tests—In adolescence W2A N148vk no. 143]

RA407.3.A347 no. 145 [RF294] 312'.0973s [312'.6] ISBN 0-8406-0024-0 74-11318

3/4

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 - Price $1.45

NATIONAL CENTER FOR HEALTH STATISTICS

EDWARD B. PERRIN, Ph.D., *Director*

PHILIP S. LAWRENCE, Sc.D., *Deputy Director*
GAIL F. FISHER, *Associate Director for the Cooperative Health Statistics System*
ELIJAH L. WHITE, *Associate Director for Data Systems*
IWAO M. MORIYAMA, Ph.D., *Associate Director for International Statistics*
EDWARD E. MINTY, *Associate Director for Management*
ROBERT A. ISRAEL, *Associate Director for Operations*
QUENTIN R. REMEIN, *Associate Director for Program Development*
ALICE HAYWOOD, *Information Officer*

DIVISION OF HEALTH EXAMINATION STATISTICS

ARTHUR J. McDOWELL, *Director*
PETER V. V. HAMILL, M.D., *Medical Advisor, Children and Youths Programs*
JEAN ROBERTS, *Chief, Medical Statistics Section*
HENRY W. MILLER, *Chief, Operations Branch*

COOPERATION OF THE BUREAU OF THE CENSUS

In accordance with specifications established by the National Health Survey, the Bureau of the Census, under a contractual agreement, participated in the design and selection of the sample, and carried out the first stage of the field interviewing and certain parts of the statistical processing.

Vital and Health Statistics-Series 11-No. 145

DHEW Publication No. (HRA)75-1627
Library of Congress Catalog Card Number 74-11318

CONTENTS

	Page
Introduction	1
Hearing Measurement and Related ENT Examination	3
Acoustical Environment	4
Audiometer Calibration and Other Aspects of Quality Control	5
Findings	7
Age and Sex	11
Race	12
Region	14
Size of Place of Residence	15
Family Income	15
Education of Parent	17
Estimated Hearing Levels for Speech	18
Comparison with Previous Studies	21
Summary	22
References	24
List of Detailed Tables	25
Appendix I. Statistical Notes	76
The Survey Design	76
Reliability	77
Sampling and Measurement Error	79
Small Numbers	79
Appendix II. Demographic and Socioeconomic Terms	81
Appendix III. Recording Form	83
Appendix IV. Standards for Reference (Audiometric) Zero	84

SYMBOLS

Data not available	...
Category not applicable	...
Quantity zero	-
Quantity more than 0 but less than 0.05	0.0
Figure does not meet standards of reliability or precision	*

HEARING LEVELS OF U.S. YOUTHS 12-17 YEARS

Jean Roberts and Elizabeth M. Ahuja, *Division of Health Examination Statistics*

INTRODUCTION

This report gives national estimates of the hearing levels of youths 12-17 years of age in the civilian noninstitutionalized population of the United States. These are based on individual monaural pure-tone audiometric test results, at eight frequencies obtained in the Health Examination Survey of 1966-70 for a national probability sample representative of the 22.7 million youths in that segment of the population. Findings have been analyzed with respect to age, sex, race, geographic region, size of place of residence, family income, and education of parent.

The Health Examination Survey is one of the major programs of the National Center for Health Statistics, authorized through the National Health Survey Act of 1956 by the 84th Congress as a continuing Public Health Service function to determine the health status of the population.[1]

In the National Center for Health Statistics, the principal health survey programs include the Health Examination, Health Interview, Health Manpower and Facilities, and Health Resources Utilization. The Health Interview Survey, which collects health information from samples of people by household interview, studies primarily the impact of known illness and disability on the lives of people. The Health Manpower and Facilities programs obtain information through surveys of hospitals, nursing homes, and other resident institutions, and the entire range of personnel in the health occupations. The Health Resources Utilization surveys obtain information on the extent of health facility and service utilization. The Health Examination Survey collects data through direct physical examinations, tests, and measurements performed on scientifically selected nationwide probability samples of the population. This system, in addition to providing the most efficient way of obtaining actual diagnostic data on the prevalence of specified medically defined illness, is the only one of the survey programs to secure information on unrecognized or undiagnosed conditions as well as a variety of physical, physiological, and psychological measures within the population. In conjunction with the examination, medical history, demographic and socioeconomic data were obtained on the sample population under study with which the examination findings for these persons may be interrelated.

The Health Examination Survey is planned as a series of separate programs called "cycles." Each cycle is limited to specific aspects of health within specific segments of the U.S. population. The first cycle in 1960-62 was designed primarily to provide data on the prevalence of certain chronic diseases and on the distribution of various physical and physiological measures in a defined adult population.[2,3]

The target population for the second cycle in 1963-65 was the noninstitutionalized children 6-11 years of age. For it the examination was

focused primarily on health factors related to growth and development.[4,5]

The third cycle, on which the findings in this report are based, was designed as in the preceding children's program to collect data on the health status of the youth population with particular emphasis on factors and conditions related to their growth and development. For this a probability sample of the noninstitutionalized youths 12-17 years in the United States was selected and examined. The questionnaires and examination content and procedures were similar to those in the children's program, so as to obtain comparable information for the entire continuum of childhood through adolescence, but were supplemented, as necessary, to obtain data specifically related to adolescent health. Included were a physical examination given by a pediatrician assisted by a nurse, tests administered by a psychologist, and a variety of tests and measurements by laboratory X-ray technicians. The survey plan, sample design, examination content, and operation of this survey program have been described in a previous report.[6]

Policies for the testing of hearing and the related examination of the ears, nose, and throat were provided through the Subcommittee on Hearing in Children of the Committee on Conservation of Hearing of the American Academy of Ophthalmology and Otolaryngology, of which Dr. Raymond E. Jordan was Chairman. Members of the subcommittee also made onsite visits to review the ongoing hearing examination. Facilities for the testing of hearing, training of technicians in testing and in instrument calibration, and conduct of acoustical surveys were made available through this group. Dr. Eldon L. Eagles, Executive Director of the Subcommittee, served as principal consultant in the hearing aspects of the survey. Specific guidance on audiometric testing and the training of the technicians in this testing were given by Dr. Leo Doerfler of the University of Pittsburgh. Instrument calibration, background noise level surveys, and specific guidance on environmental control aspects of hearing testing were provided by Mr. Kenneth Stewart through his acoustics laboratory at the University of Pittsburgh. Special training in performing the ear examination was also given the survey staff pediatricians.

Field collection operations for the youths' cycle started in March 1966 and were completed in March 1970. Of the 7,514 youths selected in the national probability sample, 6,768 or 90 percent were examined. This national sample is representative, and the examined group is closely representative of the 22.7 million civilian noninstitutionalized youths 12-17 years in the United States with respect to age, sex, race, region, population size of place of residence, and rate of change in size of place of residence from 1950 to 1960.

As in the preceding program among children, examinations in the youths' cycle were done consecutively in 40 different locations throughout the United States. Each youth during his single visit was given a standardized examination by the examining team in the mobile units specially designed for use in the survey. The only exception was that the girls whose urine specimens were found positive for bacteriuria were brought back for repeat urine tests. Prior to the examination, demographic and socioeconomic data on household members as well as medical history, behavioral, and related data on the youth to be examined were obtained from his parents. In addition, a Health Habits and History form was completed by the youth before he arrived for the examination and a Health Behavior form was completed by him while in the examination center. Ancillary data were requested from the school attended by the youth including his grade placement, teacher's ratings of his behavior and adjustment, and health problems known to his teacher. A birth certificate was obtained for each youth to verify his age and provide information related to his condition at birth.

Statistical notes on the survey design, reliability of the data, and sampling and measurement error are shown in appendix I. Definitions of the demographic and socioeconomic terms are in appendix II.

HEARING MEASUREMENT AND RELATED ENT EXAMINATION

Hearing threshold levels for the right and left ear of each youth were determined individually at eight frequencies—250, 500, 1000, 2000, 3000, 4000, 6000, and 8000 Hertz (Hz-cycles per second). Testing was done in an acoustically treated room using air-conduction earphones with standard pure-tone audiometers and methods identical to those in the preceding survey among children. The related examination of the youth's ears, nose, and throat (ENT) given by the survey staff pediatrician included a general inspection of the external ears, routine otoscopic examination of the external auditory canals and tympanic membranes, pneumatic otoscopy, and inspection of the anterior nares, tonsils, and oral pharynx identical (with a few minor deletions) to that for children in the preceding survey.[7]

Testing was done by technicians specially trained in the use of a modified Hughson-Westlake method in which the tone was first introduced at a 60-decibel (dB) intensity, decreased by 10-dB steps until no response was obtained, then increased 5 dB and dropped 10 dB until the lowest intensity was reached (threshold) at which responses were obtained in 2 out of 3 or 3 out of 5 ascending trials. For the testing, the youth was seated with his back to the window in the acoustically treated test room in which the door had been closed. The youth was seated opposite, but not directly facing the tester, so the examinee could not see when the signal was presented. The technician made certain that the youth's ears were not obstructed with cotton, that eyeglasses, hearing aids, earrings, and chewing gum were removed, and that hair was pulled back off the ears. The technician then placed the earphone opening over the ear canal making sure that the earphone made a good seal against the youth's ear. The red earphone was placed on the right ear, the gray on the left.

Hearing threshold or level, as used in this report, is the lowest intensity of a pure tone produced in the audiometer earphone that the youth reports as just audible to his ear under test, in at least one-half of the specified number of trials. Standard audiometers for 82 percent of the tests among youths were calibrated and maintained in calibration in accordance with the 1951 American Standard Association (ASA) specifications[8] in which the zero sound intensity level on the dial of these instruments corresponds to the threshold of hearing for "normal" subjects with no history of otological disease or difficulty hearing, as determined in the 1935-36 National Health Survey. The "audiometric zero (ASA-1951)" or zero point on the audiometer was expressed in terms of the sound pressure levels in decibels produced by the earphones in a National Bureau of Standards (NBS) 9-A coupler when the voltages corresponding to this threshold of hearing are applied. This audiometric zero point corresponds to a different sound pressure level for each test frequency. During the latter part of the survey, as the older audiometers became more difficult to recalibrate to ASA standards, they were replaced with newer standard audiometers calibrated and maintained in calibration in accordance with the 1969 American National Standards Institute (ANSI) specifications which incorporated the standards set in 1964 by the International Organization for Standardization (ISO).[9,10] The audiometric zero points at each frequency in the ASA-1951 Standard were revised for the ISO-1964 and ANSI-1969 Standards on the basis of more recent audiometric test data on human subjects from a large number of acoustics laboratories in various countries that were obtained with improved equipment not available at the time the 1935-1936 National Health Survey normative data were obtained.

Measurement of hearing level could be made in 5-decibel steps from 100 decibels above to 10 decibels below the audiometric zero point on the ASA-1951 audiometers and from 80 decibels above to 10 decibels below the audiometric zero point on the ANSI-1969 equipment. Since the hearing of youths is substantially more sensitive than that of the adults tested in the Health Examination Survey of 1960-62, the audiometers

were modified by the insertion of a 30-decibel attenuator so that testing could be done as low as 40 decibels below audiometric zero in a stable part of the range of the instrument as was done in the preceding survey among children. This made a corresponding reduction in the upper limit of intensity available for testing (to 60 dB on the ASA-1951 instruments and 40 dB on the ANSI-1969 units). Later the value of the attenuator was subtracted to obtain the actual hearing level of the examinee in decibels. The decibel values re audiometric zero, as used here, are defined as 20 times the logarithm to the base 10 of the ratio of the sound pressure at the examinee's threshold of audibility (his zero sensation level) to the reference sound pressure established for the audiometer (audiometric zero) used. Both sound pressures in this ratio are usually expressed in decibels re 0.0002 dynes per square centimeter.

For analytic purposes the two sets of measurements—the 82 percent from ASA-1951 instruments and the 18 percent from ANSI-1969 (ISO-1964) instruments—were later all converted to both units using the appropriate values shown in appendix IV for each examinee. Some of the basic hearing level findings for youths in this report are shown both in the ASA-1951 and ANSI-1969 units to provide continuity with published findings for U.S. adults from the 1960-62 survey and for U.S. children from the 1963-65 survey, which were obtained and published only in terms of the ASA-1951 units.

Before the earphones were placed, the youth was instructed not to touch them once they were in place. He was also told that the sound coming from them would be like whistles or horns which would be heard in one ear at a time and which would get progressively fainter. The youth was asked to show when the sound was heard and in which ear by raising his right or left index finger. He was further told to raise his index finger even though the sound was very faint and to keep it raised until the sound was no longer heard.

Prior to the test the instrument power was on for at least 10 minutes. The sequence of testing was done in a randomized fashion starting with 4000 Hertz, then proceeding to 1000, 6000, 500, 2000, 250, 4000, 8000, and 3000. Testing of the ears was alternated starting with the right ear for youths with even numbered records and with the left ear for youths with odd case numbers (appendix III).

After the testing the technician indicated on the record what conditions, if any, affected the test results, such as a cold, ear discharge, defective equipment, earache, or other. If the technician indicated that because of the condition he felt the hearing test results were unreliable, these results were not used. The extent of missing data either because the test was not given or the results unreliable and the methods used in estimation of these missing values are shown in appendix I.

The technicians were trained to avoid rhythmic presentation of signals to the youth, to skip to another threshold temporarily to avoid a long, drawn out search for a particular threshold, to avoid visual or auditory clues when presenting the tone, and to avoid distracting activity.

After each test session a disinfectant was applied to the headband and earphones.

Acoustical Environment

Hearing was tested in an acoustically treated room within a specially constructed trailer in the mobile examining center. Inside dimensions of the room measured 84 by 156 by 96 inches. Walls, door, and ceiling were constructed of 4-inch thick acoustical panels of heavy steel. The room had incandescent lighting and continuous but quiet ventilation.

Performance of the room in attenuating external noise was checked periodically throughout the cycle by acoustical surveys conducted under normal test conditions. Sound pressure levels were measured both inside and outside the test area with and without the air-conditioning equipment and under other conditions of excess noise. When compared with the American Standards Association's maximum allowable sound pressure levels for no masking above audiometric zero (ASA-1951),[11] the findings (shown in table

Table A. Acoustical survey[1] of the noise levels[2] in the test room used for audiometry in the Health Examination Survey, 1966-70

Frequency band (Hertz)	Audiometric test frequency (Hertz)	Maximum allowable sound pressure for no masking above audiometric zero from 1951 American Standard (dB)	Instrument noise (dB)	Sound pressure level (dB) inside test room	
				All air conditioning off	All air conditioning on
20–75	50	40	14	38–42	46–48
75–150	125	40	12	26	38–40
150–300	[3]250	40	12	12	16
300–600	[3]500	40	11	10–11	12–13
600–1200	750	40			
600–1200	[3]1000	40	11	10	12
1200–2400	1500	42			
1200–2400	[3]2000	47	11	10	11–12
2400–4800	[3]3000	52			
2400–4800	[3]4000	57	12	10	11–12
4800–10000	[3]6000	62			
4800–10000	[3]8000	67	12	12	12

[1] July 22, 1966, at Portland, Maine.
[2] Sound pressures in decibels re 0.0002 dyne per cm^2.
[3] Test frequencies used in this study.

A) indicate that under normal conditions with air-conditioning equipment on, the room would have provided sufficient attenuation of ambient noise for testing to at least 20 decibels below audiometric zero (ASA-1951) at all test frequencies. The lowest hearing level for which there would be no masking ranged from 24 decibels below audiometric zero (ASA-1951) at 250 Hertz to 27-35 decibels below at 500-2000 Hertz and 40 decibels or more below from 3000-8000 Hertz. Hence for all practical purposes only at the 250 Hertz frequency could masking due to ambient noise have produced an elevated rather than a true hearing level for the few youths whose hearing levels were unusually low (less than 24 decibels below audiometric zero, ASA-1951).

During the survey it was not always possible to select locations for the examining center that presented an ideal acoustical environment for hearing testing at all times and still meet other conditions necessary for the rest of the survey examination. Nevertheless, analysis of the findings for the frequencies below 2000 Hertz gives no real evidence of any noticeable degree of masking from external noise, indicating that the acoustical environment was adequate for testing to these low levels.

Audiometer Calibration and Other Aspects of Quality Control

The audiometers used in this survey to measure hearing acuity were primarily Maico instruments—standard electroacoustical generators with air-conduction earphones (receivers) of type TDH-39 with MX-41/AR cushions, providing pure tones of selected frequencies and intensities which cover the major portion of the auditory range, and with a manual device for interrupting the tone.

The audiometers were modified and calibrated at the Acoustics Laboratory of the University of Pittsburgh to furnish reading in terms of hearing levels in decibels on the NBS 9-A calibrating coupler relative to the audiometric zero used in the particular instrument—ASA-1951 or ANSI-1969—at frequencies of 125, 250, 500, 750, 1000, 1500, 2000, 3000, 4000, 6000, and 8000 Hertz. The audiometric zero (American Stand-

ard, 1951) for air-conduction testing is based on findings from the clinical followup to the 1935-36 National Health Survey for that subgroup of persons considered to have "normal" hearing. This subgroup consisted of 1,212 persons, of all ages and both sexes, who gave a history of normal hearing for speech and whose hearing levels (determined by air-conduction tests) for both ears did not exceed a total variation of 15 or 20 decibels on the eight tones from 64 to 8192 Hertz.[12,13]

When voltages corresponding to audiometric zero are applied, the sound pressure levels produced by the audiometric earphones commercially available at the time of these surveys differed for each type and configuration of earphone. An indication of the extent of variability among three of the TDH-39 earphones used at some time during the 1960-70 period in the Health Examination Surveys was obtained in a loudness balance study on human subjects made by Mr. Stewart and Dr. Ernest Burgi at the University of Pittsburgh Acoustics Laboratory for the Health Examination Survey.[14] The ASA-1951 reference zero levels used in laboratory calibration of the TDH-39 earphones of the audiometers in the Health Examination Survey, together with the corresponding present international reference zero levels for pure-tone audiometers adopted by the American National Standards Institute (ANSI) in 1969 are shown in appendix IV. Conversion to the ANSI-1969 levels were made assuming that the magnitude of the difference in reference zero points for the WE-705A earphones and TDH-39 earphones would be the same in terms of the ANSI-1969 standard as had existed in the ASA-1951 standard.

During the survey among youths, each audiometer was returned to the Acoustics Laboratory at the University of Pittsburgh for recalibration after each of the 40 stands (locations) of the examinations and also on the few occasions when monitoring and calibration indicated that the instrument was not functioning adequately. Laboratory calibration procedures routinely included tests to determine whether the instruments were within the following American Standards Association specifications:[8]

1. Frequencies generated by the audiometer within ±5 percent of the corresponding frequency reading on the instrument.
2. The sound pressure produced by the earphones at each hearing level intensity readings at each frequency not differing from the normal values by more than 4 decibels at frequencies of 2000 Hertz or less and by not more than 5 decibels at frequencies above 2000 Hertz.
3. The 5-decibel intervals between successive hearing level readings being not less than 3.5 decibels or more than 6.5 decibels.
4. The time required for the test tone to rise to a value within ±1 decibel of the required sound pressure being not less than 0.1 second and not more than 0.5 seconds.
5. The sound pressure of the fundamental signal being at least 25 decibels above the sound pressure of any harmonic.

A typical laboratory calibration report from the University of Pittsburgh for one of the audiometers used in the survey among youths is shown in table B.

In the field, audiometers were checked by the technician twice each day—in the morning after the 10-minute warmup period, before testing was started, and again after testing was completed for the day. In addition, a weekly field sound pressure calibration at set intensity levels was performed using Brüel and Kjaer Precision Sound Level Meters and Artificial Ear Couplers. Reports of the field calibration were sent routinely to the acoustics laboratory for review. The field testing equipment was calibrated periodically by the acoustics laboratory.

As previously stated, each ear was retested at 4000 Hertz to provide a measure of the reliability of the test results. On the average at the various examination locations, the differences ranged from 1 to 4 decibels or less than the interval between test intensities, the magnitude that might be expected in test-retest of normal subjects.[15]

Table B. Typical audiometer calibration results for audiometer No. 3536

Instrument frequency (Hertz)	Actual frequency (Hertz)[1]	Intensity error (dB)[2]		Second harmonic below fundamental frequence of (dB)[3]		Attenuator[4]	
		Red phone	Gray phone	Red phone	Gray phone	Expected range (dB)	Actual interval (dB)
250	257	-0.5	-1.5	35+	35+	95 - 100	4.7
500	506	-0.1	-0.3	35+	35+	90 - 95	4.9
1000	1015	-1.7	-2.1	35+	35+	85 - 90	5.0
2000	1993	-1.3	-1.7	27.0+	35+	80 - 85	5.0
3000	2999	+0.3	+0.5	35+	35+	75 - 80	5.0
4000	4026	+0.4	-0.3	35+	35+	70 - 75	5.1
6000	6011	+2.9	-0.4	35+	35+	65 - 70	5.2
8000	7963	+2.9	+1.0	35+	35+	60 - 65	5.0
						55 - 60	5.2
						50 - 55	5.0
Actual attenuation of 30 dB pad = 29.2 dB						45 - 50	5.1
						40 - 45	4.9
Line voltage variation: 105–125 = 0.5 dB (ASA tolerance is 2 dB)						35 - 40	5.1
						30 - 35	4.9
						25 - 30	5.1
Overshoot and undershoot within ASA tolerance limits of ± 1 dB						20 - 25	4.8
						15 - 20	4.9
Onset time within ASA tolerance limits of .1 to .5 sec.						10 - 15	5.0
						5 - 10	4.9
						0 - 5	4.9
Decay time within ASA tolerance limits from 20 dB or more within .5 sec.						- 5 - 0	4.8
						-10 - -5	5.0

[1] ASA frequency tolerance ±5 percent.
[2] ASA intensity tolerance at 250–2000 Hz is ±4 dB, at 3000+ ±5 dB. Obtained at hearing level dial readings of 60 dB.
[3] ASA second harmonic tolerance is 25 dB at 500, 1000, 2000, and 4000 Hz.
[4] ASA tolerance ±1.5 dB.

The randomized order of presentation of the frequencies provided a further safeguard against errors in testing.

FINDINGS

More than half of the youths 12-17 years of age in the noninstitutional population of the United States have, at least for the better ear, hearing thresholds lower (better) than the "normal" or audiometric zero values in the 1951 American Standard (ASA-1951) across all test frequencies except 6000 Hertz, as estimated from the Health Examination Survey of 1966-70. At all frequencies except 3000-6000 Hertz, at least 75 percent of youths have hearing levels lower than these ASA-1951 audiometric zero values (figure 1). Thus it is apparent that the "normal" threshold values obtained from the 1935-36 National Health Survey followup study on otologically normal persons were substantially higher (poorer) than the thresholds for more than half of the U.S. youths in the present study across all octave frequencies—250, 500, 1000, 2000, 4000, and 8000 Hertz.

In contrast, when hearing levels of these youths are examined in relation to the 1969 American Standard audiometric zeros (ANSI-1969) substantially less than one-half have thresholds below these newer "normal" values—the proportion ranging from 25 percent or less at frequencies of 250-500 and 3000-8000 Hertz to 40 and 45 per-

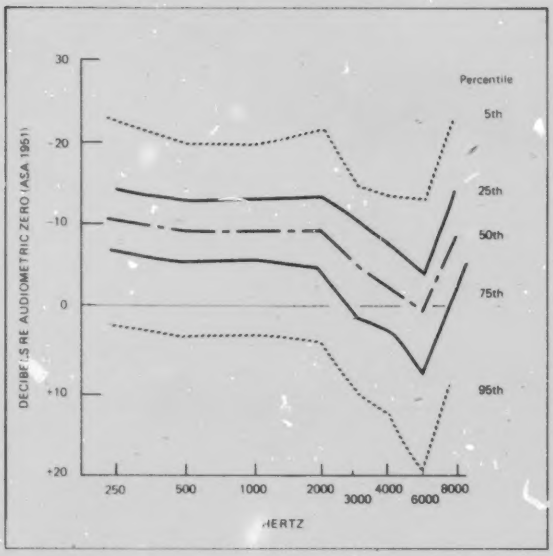

Figure 1. Selected percentiles from the distribution of hearing threshold levels (re ASA-1951) for the better ear of youths 12-17 years, at each test frequency: United States, 1966-70.

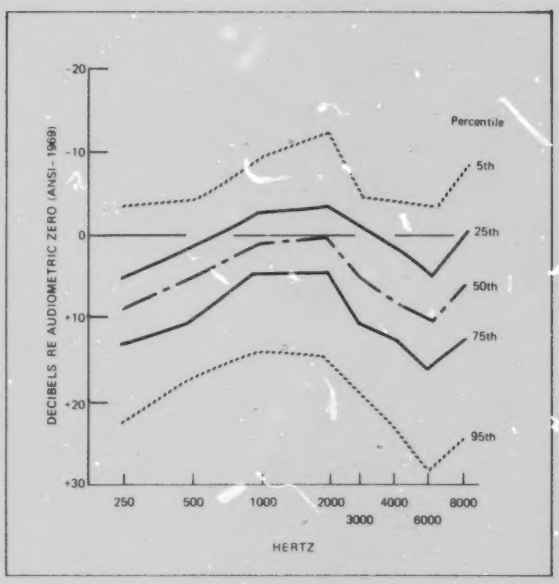

Figure 2. Selected percentiles from the distribution of hearing threshold levels (re ANSI-1969) for the better ear of youths 12-17 years, at each test frequency: United States, 1966-70.

cent at 1000 and 2000 Hertz (figure 2). Hence only at 1000 and 2000 Hertz do roughly half of the U.S. youth population approach the "normal" threshold values in the 1969 American Standard. A subsequent report on the ear-nose-throat examination findings will determine how closely the otologically normal youths in this study approach these newer "normal" values.

Hearing sensitivity of youths 12-17 years when measured in decibel values based on the 1951 American Standard, similar to the findings for children 6-11 years in the preceding 1963-65 national survey,[7] generally decreases with increase in tonal frequency up to 6000 Hertz—slowly from 250-2000, then rapidly from 2000-6000 Hertz. The slight depression in median and other percentile values at 2000 Hertz noted in the national survey among children was not evident for the youth population. Hearing levels (in decibels re ASA-1951) for young U.S. adults 18-24 years of age as determined from the 1960-62 Health Examination Survey also show a similar pattern of increase in thresholds (progressively poorer or less sensitive hearing in relation to the ASA-1951 norms) from 2000-6000 Hertz.[16]

When measured in decibel units based on the 1969 American Standard, hearing sensitivity of youths increased with increase in frequency from 250 to 1000 Hertz, but then median and other percentile values showed a pattern of decrease from 2000-6000 Hertz and an increase from 6000-8000 Hertz similar to that when measurements were in decibel units based on the 1951 American Standard audiometric zeros. (It is readily apparent from appendix IV that the actual intensity of sound for "normal" thresholds of hearing from either standard actually decreases from 250-1000 Hertz, then roughly levels off. The patterns of deviation in hearing thresholds described above from either standard in the present and preceding Health Examination surveys reflect the variations in agreement with the standard or "normal" values across the test frequencies. Obviously agreement is closest with the ANSI-1969 Standard at 1000 and 2000 Hertz for the U.S. child, youth, and young adult populations.)

Mean hearing levels of youths also tend to be less sensitive at the higher frequencies from 3000 to 6000 Hertz than at the lower tones

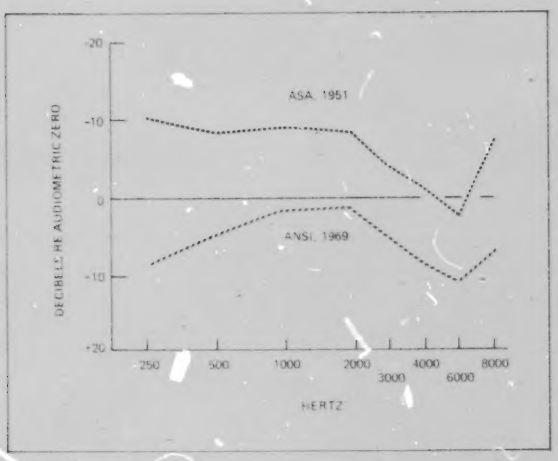

Figure 3. Mean hearing levels of youths 12-17 years at each test frequency in terms of decibels re audiometric zero—ASA 1951 and ANSI 1969: United States, 1966-70.

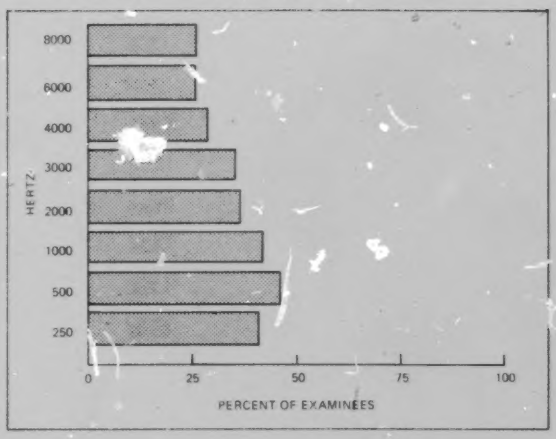

Figure 4. Percent of youths 12-17 years with difference in hearing levels between both ears of 5 decibels or less: United States, 1966-70.

from 250-2000 Hertz in terms of the 1951 American Standard, but only higher than at 1000 and 2000 Hertz in relation to the 1969 American Standard values for audiometric zero ("normal"). Mean thresholds (in decibels re ASA-1951) were below these audiometric zero values at all frequencies except 6000 Hertz, ranging from a low of -10.0 decibels at 250 Hertz to -1.1 decibels at 4000 Hertz and to +2.0 decibels at 6000 Hertz (table 1). In contrast, when decibel values were based on the ANSI-1969 audiometric zeros, the mean hearing thresholds are consistently less sensitive than the levels considered normal, varying between a low of +1.1 decibels at 2000 Hertz and the maximum of +11.2 decibels at 6000 Hertz (figure 3 and table 2).

Hearing thresholds for the right and left ear of a particular individual tended to be dissimilar for the majority of U.S. youths with the extent of right-left ear agreement diminishing with the increase in frequency. The best agreement was at 500 Hertz where test levels for the two ears differed by no more than 5 decibels for about 46 percent of the youths. Poorest agreement was at 6000 and 8000 Hertz where only 26 percent of youths had similar monaural thresholds (figure 4). The extent of right-left ear agreement among U.S. youths in the present study is substantially lower than that found among U.S. children in 1963-65 and U.S. adults in 1960-62, though in both studies the agreement diminished with increase in frequency. Among U.S. children the percent with no more than a 5-decibel difference between the ears decreased from 88 percent at 250-500 Hertz to lows of 67 and 69 percent at 6000 and 8000 Hertz; while among adults the proportion decreased steadily from 80 percent at 1000 Hertz to 50 percent at 6000 Hertz.

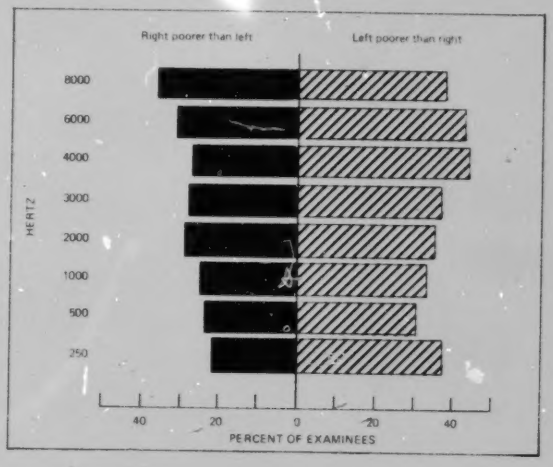

Figure 5. Percent of youths 12-17 years with hearing levels in the two ears differing by more than 5 decibels: United States, 1966-70.

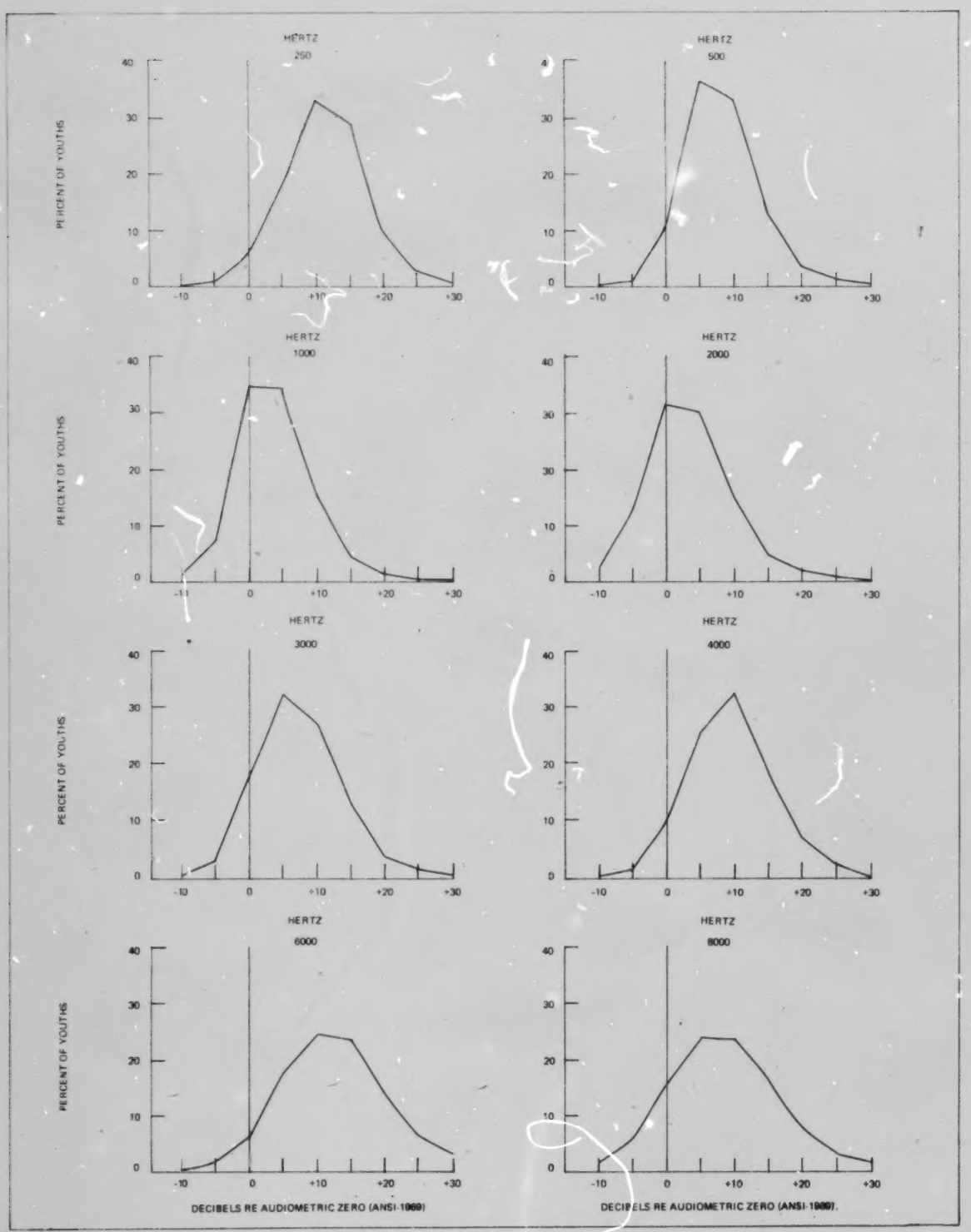

Figure 6. Percent distribution of youths 12-17 years, by hearing levels for the better ear at each test frequency: United States, 1966-70.

17

When the two ears of an individual youth did differ in hearing sensitivity (by more than 5 dB), at all frequencies the left ear was substantially more likely than the right to be the less sensitive (figure 5). These findings are consistent with the findings among U.S. children in 1963-65 and U.S. adults in 1960-62. In all three surveys any practice effect for one ear or the other was minimized for the groups by alternating the sequence of first ear tested from one examinee to the next and from one frequency to the next.

Among U.S. youths the distribution of hearing levels is slightly skewed to the right for all frequencies (figure 6 and tables 3-8), similar to the earlier findings among U.S. children and young adults.

Age and Sex

At 250-1000 Hertz there is little difference between the hearing threshold levels of boys and girls (figures 7 and 8 and tables 1-19). However, at the higher frequencies, 2000-8000 Hertz, mean and median levels for boys consistently exceed (poorer) those for girls by differences large enough to be statistically significant (at the 5-percent probability level).

For both sexes, the hearing sensitivity varied by less than 2 decibels over the 12-17 year age range at each frequency (except at 6000 Hertz where the variation among boys exceeded 2.5 dB), with no consistent trend in increasing or decreasing hearing sensitivity with increasing age.

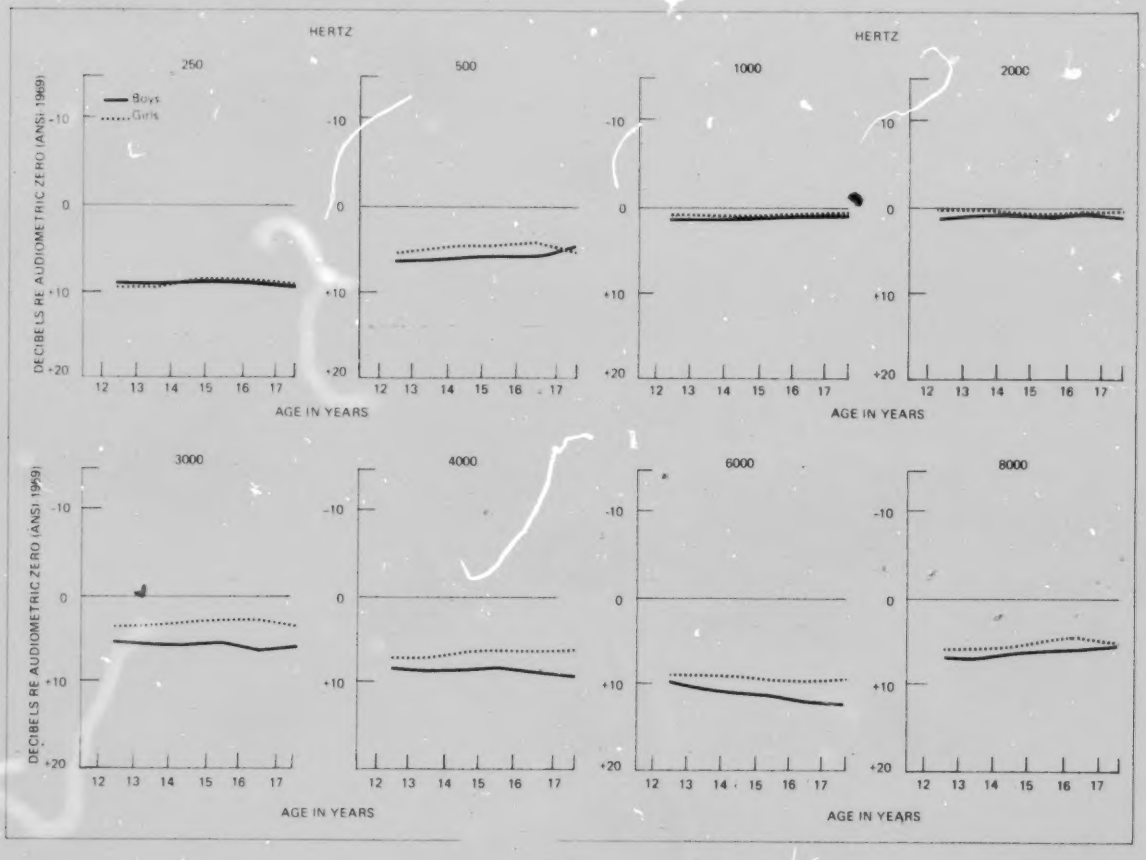

Figure 7. Median hearing levels for the better ear of youths, by age and sex at each test frequency: United States, 1966-70.

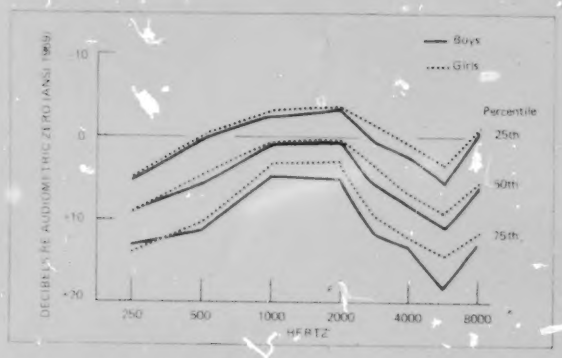

Figure 8. Median and quartiles (50th, 25th, and 75th percentiles) from the distribution of hearing threshold levels for the better ear of youths 12-17 years at selected frequencies, by sex: United States, 1966-70.

Figure 9. Mean hearing levels of white and Negro youths 12-17 years at each test frequency: United States, 1966-70.

This fairly stable age pattern for youths was in sharp contrast to the findings among U.S. children 6-11 years in the 1963-65 national study, in which there was a consistent pattern of increasing hearing sensitivity with age at the lower tones under 3000 Hertz. This would tend to reinforce the indication in the earlier study that at least part of this trend among children was probably due to the shorter attention span and the less good fit of the earphones among the younger children.

No breakdown by age was published for the young U.S. adults in the 1960-62 study. However, median thresholds for women 18-24 years were consistently lower (better) than those for young men of that age at all six test frequencies, generally consistent with the findings among U.S. children and youths.

Race

White youths age 12-17 years had better hearing on the average than Negro youths in the United States in the middle frequencies 1000-4000 Hertz, with mean differences large enough to be statistically significant at 1000-4000 Hertz (figure 9 and tables 1 and 2). At the higher tones, 6000-8000 Hertz, and to a lesser degree the lowest (250 Hertz), Negro youths had more sensitive hearing than white youths, but only the mean difference at 6000 Hertz was large enough to be statistically significant. While this pattern generally persisted throughout the age range, mean differences were not large enough to be statistically significant throughout. Mean levels for the other races are shown as a group in tables 1 and 2, but the sample used in this study was not large enough to provide reliable national estimates for this small heterogeneous group in the population.

White girls consistently had more sensitive hearing than their Negro counterparts over the entire range of frequencies (except at 6000 Hertz) with mean differences large enough to be statistically significant at 1000-4000 Hertz. Among boys, mean thresholds for white youths in the middle frequencies, 1000-3000 Hertz, were lower (better hearing) than for the Negro, while at the extremes of the tonal range the reverse was found. Only at 250 and 6000-8000 Hertz (Negro more sensitive) and at 3000 Hertz (Negro less sensitive) were the mean differences large enough to be statistically significant.

Variability in hearing threshold levels among the youth population is greatest at 8000 Hertz, somewhat greater at the mid-octave frequencies of 3000 and 6000 Hertz, and least at 1000 Hertz for both white and Negro youths, as measured by the semi-interquartile range (tables C, 20, and 21).

The racial differences in hearing levels among youths are generally similar to those found among U.S. children in the 1963-65 survey and young U.S. adults in the 1960-62 survey.

Table C. Mean, median, and semi-interquartile range in the distribution of hearing thresholds of white and Negro youths 12-17 years at each test frequency: United States, 1966-70

Frequency	White			Negro		
	Mean	Median	$1/2(P_{75} - P_{25})$	Mean	Median	$1/2(P_{75} - P_{25})$
	Decibels re audiometric zero (ANSI-1969)					
250 Hertz	9.2	9.3	4.0	8.8	8.6	5.0
500 Hertz	5.9	5.5	5.4	5.8	4.8	5.3
1000 Hertz	1.4	0.9	3.6	2.3	1.5	4.1
2000 Hertz	1.0	0.5	4.0	2.2	1.6	4.8
3000 Hertz	5.0	4.0	5.6	7.0	6.9	5.6
4000 Hertz	7.8	7.5	5.5	9.0	8.9	4.8
6000 Hertz	11.4	10.3	5.6	9.7	9.2	5.4
8000 Hertz	6.8	6.1	6.4	6.1	5.0	6.2

NOTE: Semi-interquartile range $1/2(P_{75}-P_{25})$ includes 12.5 percent of the distribution above and 12.5 percent below the median (P_{50}).

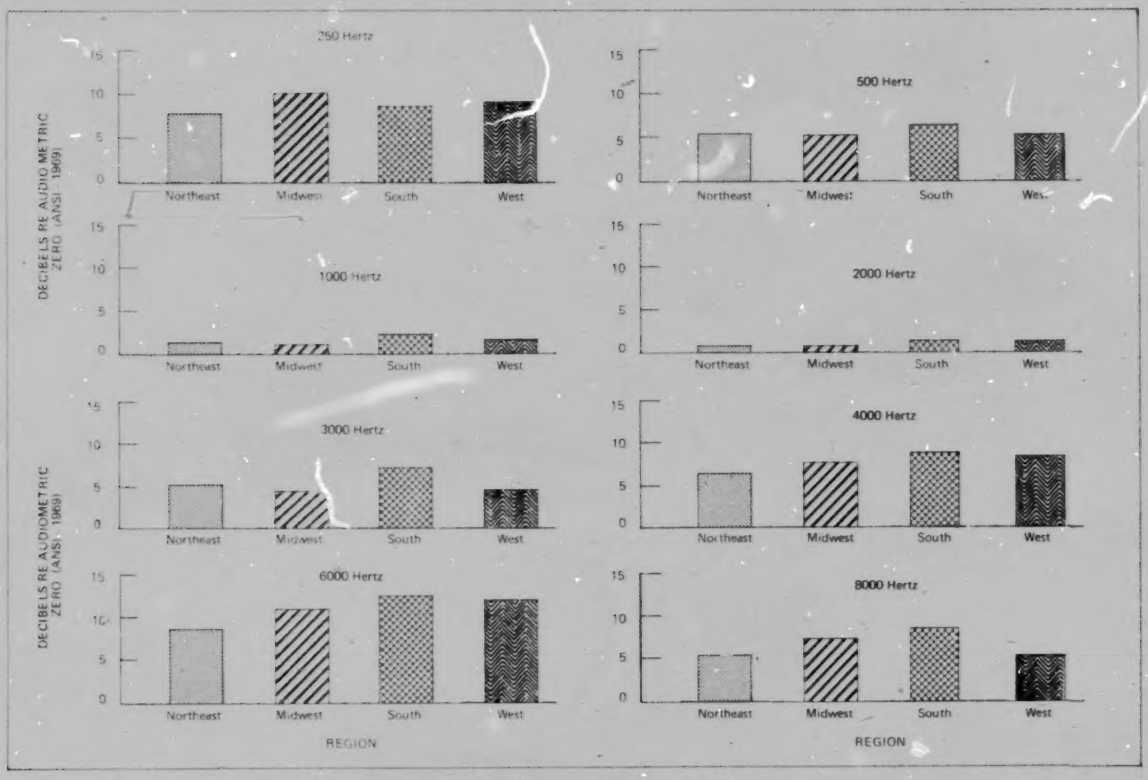

Figure 10. Mean hearing levels of youths 12-17 years at each test frequency by region: United States, 1966-70

Region

Youths living in the South had less sensitive hearing, on the average, than those in other regions of the United States except at the lowest tone, 250 Hertz, where mean levels for youths in the Midwest and West were higher (poorer hearing) (figure 10 and table 22). Less consistency exists at the other extreme. At 250, 4000, and 6000 Hertz mean thresholds for youths in the Northeast were lowest while at 500-3000 Hertz those in the Midwest had better hearing than those living elsewhere. Mean differences in hearing thresholds between those in the South and Midwest were large enough to be statistically significant at all frequencies except 2000 Hertz. Mean levels for youths in the Northeast at 4000 and 6000 Hertz were also substantially lower than those in other parts of the country.

Boys and girls 12-17 years of age in the South, except at 250 and 1000 Hertz for boys and 250 and 6000 Hertz for girls, tended to have somewhat poorer hearing levels than those in other regions of the country.

As shown in tables D and 23-26, variability in hearing thresholds among the youth population, as measured by the semi-interquartile range is consistently at least as high or higher for those in the South as elsewhere except at the highest tone, 8000 Hertz. Variability in hearing levels is greatest at that highest tone in each of the four regions.

These findings of the least sensitive hearing among youths in the South are more clear-cut but generally consistent with those for U.S. children 6-11 years in the 1963-65 study. However, among children the variability in hearing levels

Table D. Mean, median, and semi-interquartile range in the distribution of hearing thresholds of youths 12-17 years at selected frequencies, by region: United States, 1966-70

Region and measure	Frequency					
	250 Hertz	500 Hertz	1000 Hertz	2000 Hertz	4000 Hertz	8000 Hertz
	Decibels re audiometric zero (ANSI-1969)					
Northeast						
Mean	8.0	5.7	1.6	0.9	6.4	5.6
Median	8.2	5.3	1.0	0.6	6.3	4.6
$1/2(P_{75} - P_{25})$	4.8	5.4	3.6	3.8	5.5	6.2
Midwest						
Mean	10.0	5.6	1.0	0.8	7.9	7.1
Median	9.9	4.9	0.6	0.5	7.9	6.5
$1/2(P_{75} - P_{25})$	3.8	5.0	3.6	4.0	5.2	6.3
South						
Mean	8.8	6.9	2.1	1.4	8.9	8.7
Median	8.9	6.7	1.3	0.7	8.3	7.9
$1/2(P_{75} - P_{25})$	4.8	5.4	3.8	4.4	5.6	6.3
West						
Mean	9.4	5.6	1.8	1.2	8.6	5.5
Median	9.4	5.0	1.1	0.7	8.1	4.4
$1/2(P_{75} - P_{25})$	3.8	5.3	3.6	4.0	5.4	6.5

NOTE: Semi-interquartile range $1/2(P_{75} - P_{25})$ includes 12.5 percent of the distribution above and 12.5 percent below the median (P_{50}).

was generally highest among those in the West, rather than the South as noted among these youths.

Size of Place of Residence

Youths living in urban communities not differentiated by population size have hearing thresholds that differ little, on the average, from those living in rural areas of the United States (figure 11 and table 27). At the lower tones of 250-1000 Hertz, rural dwellers have slightly more sensitive hearing than their urban counterparts on the average, while urban residents have slightly better hearing at 2000-8000. None of the mean differences are large enough to be statistically significant.

There is also no consistent pattern of hearing levels among urban dwellers that varies with the population size of the community. Youths in the smallest urbanized areas of less than 250,000 (at frequencies of 250, 2000, 3000, and 8000 Hertz) and those outside urbanized areas in places of 10,000-24,999 population (at 500, 1000, 4000, and 6000 Hertz) tended to have somewhat higher mean thresholds (poorer hearing), while those in the largest metropolitan areas of 3 million or more (at 250, 500, and 4000-8000 Hertz) and 1-2.9 million population

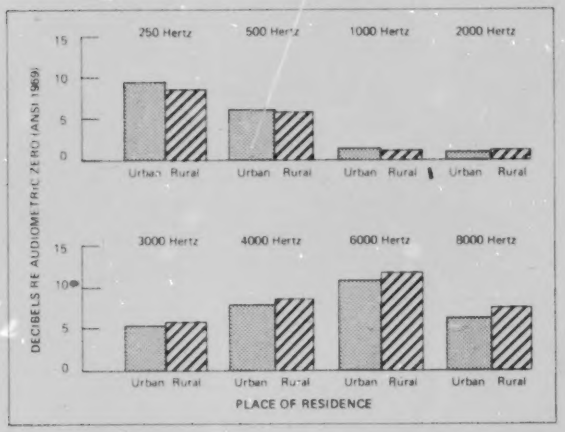

Figure 11. Mean hearing levels of urban and rural youths 12-17 years at each test frequency: United States, 1966-70.

(at 1000 Hertz) had slightly lower mean levels (better hearing) than youths living elsewhere (table 28).

These findings of negligible urban-rural differences in mean hearing thresholds for U.S. youths in the present study are generally consistent with the findings for U.S. children 6-11 years in 1963-65.

Rate of population change.—One of the three axes of stratification used in the sampling frame for this national survey as well as the preceding one among children was the extent and direction of change in population size of place of residence from 1950 to 1960. This was considered an indirect measure of the economic stability of the communities in which these youths reside. Places with an above-average gain in population during the decade were more likely to have a healthy expanding economy, while those experiencing a loss were more likely to have diminishing employment opportunities and resources for development. It might be expected that this factor of rate of population change would in turn be reflected to some extent in the degree of hearing sensitivity of youths living in these types of areas insofar as this might also reflect the availability and adequacy of medical care.

Youths living in places showing an above-average gain in population tended to have better hearing consistently across all test frequencies than those from communities where the increase was slower or there was a population loss (figure 12 and table 29). While high-low mean differences were large enough to be statistically significant at 250, 500, 4000, and 8000 Hertz, there was no other consistent relationship evident with this economic indicator.

These findings of slightly better hearing levels among youths living in communities with above-average gains in population than elsewhere are generally consistent with the findings among children 6-11 years in the 1963-65 national study.

Family Income

Hearing sensitivity of youths shows a strong, consistent relationship to the income level of

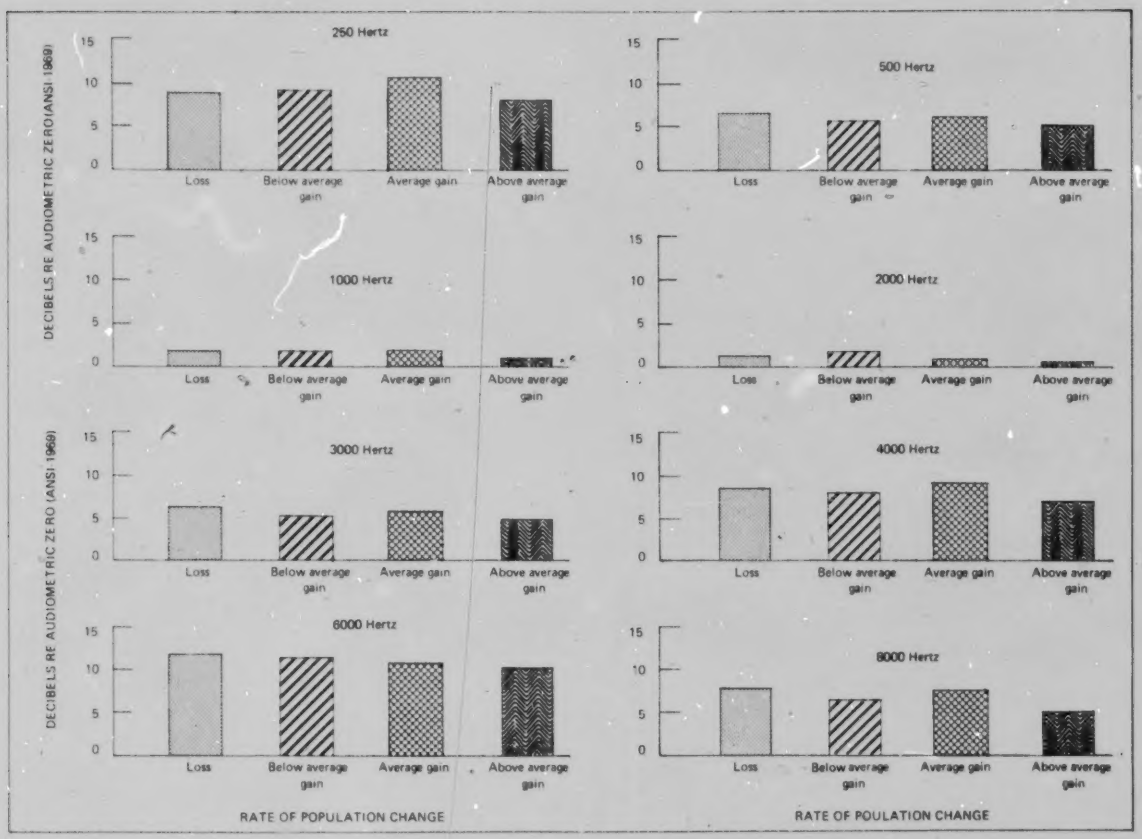

Figure 12. Mean hearing levels of youths 12-17 years at each test frequency, by rate of population change in place of residence from 1950 to 1960: United States, 1966-70.

their families (figure 13 and table 30). The least sensitive mean hearing levels across all test frequencies were consistently among youths in families with the lowest annual income, less than $3,000, while the most sensitive hearing levels were found among youths in families with annual income of $15,000 or more, except at 250 and 6000 Hertz where those in the income bracket $10,000-$14,999 had slightly lower (better) mean thresholds. The mean differences between thresholds for youths from the lowest income bracket and those from the higher brackets of $10,000 or $15,000 and over are consistently statistically significant.

Though successive differences from one income bracket to the next highest were not generally large enough to be statistically significant, the mean thresholds for youths from families with less than $5,000 a year income were consistently higher (poorer hearing) than those in families with annual income of $5,000 or more. Also at frequencies of 1000, 2000, 3000, 4000, and 8000 Hertz mean hearing thresholds of youths in the lowest income families were significantly higher (poorer) than those in families with $5,000 or more annual income.

At test frequencies of 2000 Hertz and higher, girls were found to have more sensitive hearing than boys across all income levels.

The variability in hearing sensitivity of youths,

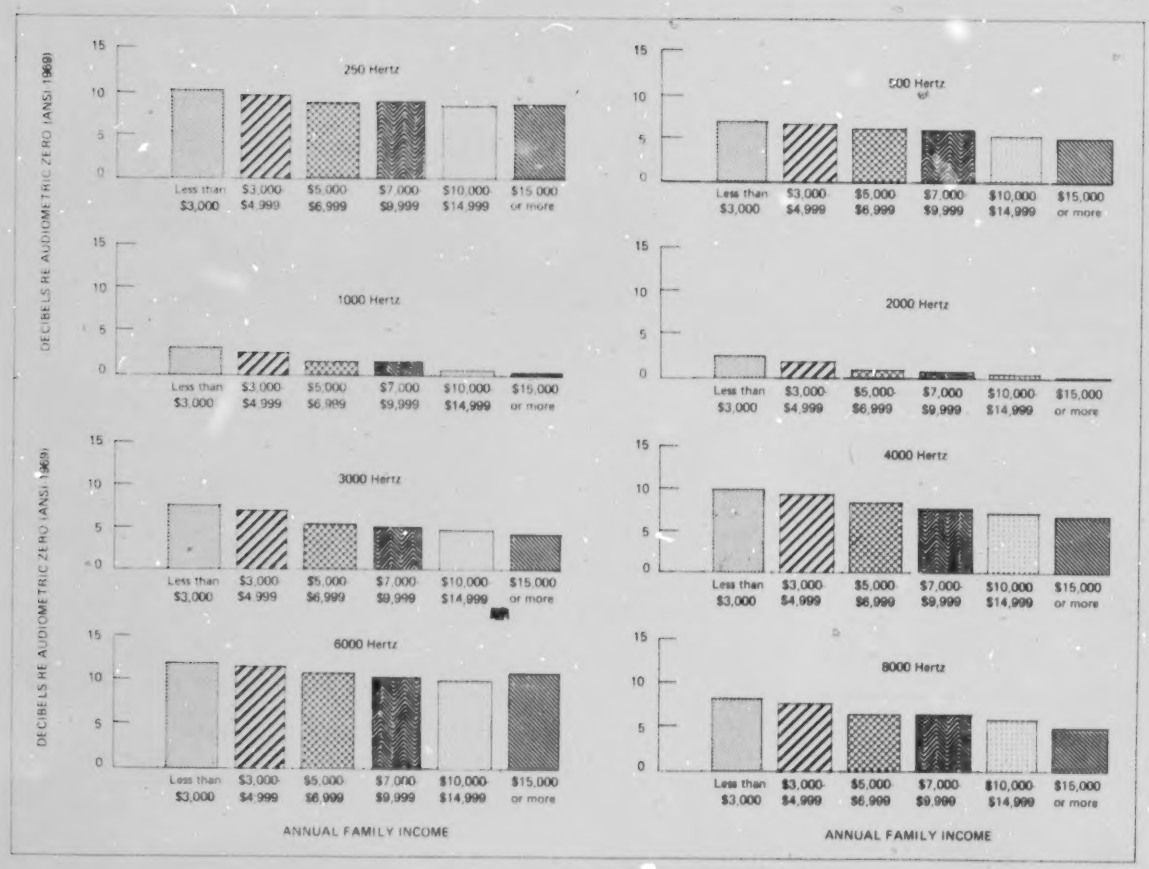

Figure 13. Mean hearing levels of youths 12-17 years at each test frequency by annual family income: United States, 1966-70.

as measured by the semi-interquartile range, generally tends to remain the same or to decrease gradually with increasing family income levels (table E).

The findings in this study among U.S. youths with respect to the relationship of hearing thresholds and annual family income are similar to those from the 1963-65 survey among U.S. children and among adults in the 1960-62 national survey. However, among children the variability in hearing sensitivity as measured by the semi-interquartile range showed no consistent pattern of relationship to family income such as that found among youths.

Education of Parent

Hearing sensitivity of youths in this country tended to increase with the number of years of formal education completed by their parent who was considered head of the household (figure 14 and table 31). Mean differences between hearing thresholds of those whose parent had the least education (less than 5 years) and those with 4 years or more of college training were large enough to be statistically significant for frequencies of 500 Hertz and higher. Generally, differences in hearing thresholds for youths between successive parent education levels were not large enough to be statistically significant.

Table E. Mean, median, and semi-interquartile range in the distribution of hearing thresholds of youths 12-17 years at each test frequency, by annual family income: United States, 1966-70

Family income and measure	Frequency							
	250 Hertz	500 Hertz	1000 Hertz	2000 Hertz	3000 Hertz	4000 Hertz	6000 Hertz	8000 Hertz
Less than $3,000	Decibels re audiometric zero (ANSI-1969)							
Mean	10.0	7.0	3.1	2.6	7.3	9.9	12.2	8.4
Median	9.8	6.6	1.9	1.6	6.9	9.2	11.0	7.1
$1/2(P_{75}-P_{25})$	4.2	5.6	4.6	4.8	5.7	5.1	6.5	6.7
$3,000–$4,999								
Mean	9.8	6.9	2.6	1.9	6.6	9.2	11.8	7.8
Median	9.8	6.8	1.9	1.3	5.9	8.8	10.7	7.0
$1/2(P_{75}-P_{25})$	4.2	5.4	4.4	4.6	5.6	4.8	5.6	6.5
$5,000–$6,999								
Mean	9.0	6.0	1.6	1.0	5.2	8.0	11.1	6.6
Median	9.1	5.8	1.1	0.6	4.1	7.9	10.2	5.8
$1/2(P_{75}-P_{25})$	4.0	5.3	3.6	3.8	5.5	5.4	6.0	6.4
$7,000–$9,999								
Mean	9.1	5.8	1.6	0.8	4.9	7.6	10.9	6.6
Median	9.1	5.4	0.9	0.5	4.0	7.3	9.8	5.7
$1/2(P_{75}-P_{25})$	4.1	5.4	3.5	3.9	5.6	5.5	5.2	6.4
$10,000–$14,000								
Mean	8.7	5.1	0.8	0.4	4.4	6.8	10.4	6.0
Median	9.0	4.2	0.5	0.1	3.5	6.5	9.8	5.7
$1/2(P_{75}-P_{25})$	4.0	5.2	3.6	4.2	5.4	5.6	5.4	6.2
$15,000 or more								
Mean	8.8	5.0	0.2	0.1	4.1	6.4	11.0	5.2
Median	9.1	4.6	0.3	-0.1	3.4	6.6	9.9	4.7
$1/2(P_{75}-P_{25})$	3.8	5.3	3.4	4.0	5.4	5.4	5.7	6.4

NOTE: Semi-interquartile range $1/2(P_{75}-P_{25})$ includes 12.5 percent of the distribution above and 12.5 percent below the median (P_{50}).

These findings among youths with respect to the positive relationship of parent education to the youth's hearing differed little from those among U.S. children in the 1963-65 survey and among U.S. adults in the 1960-62 survey.

Estimated Hearing Levels for Speech

As in the previous Health Examination surveys among adults and children, speech-reception thresholds were not measured for youths in this survey examination. However, a frequently used method recommended by the American Medical Association's Committee on Medical Rating of Physical Impairment[17] and the American Academy of Ophthalmology and Otolaryngology[18] is obtained by averaging the levels of the pure-tone frequencies usually considered most essential for understanding speech—500, 1000, and 2000 Hertz for the better ear. Data from the

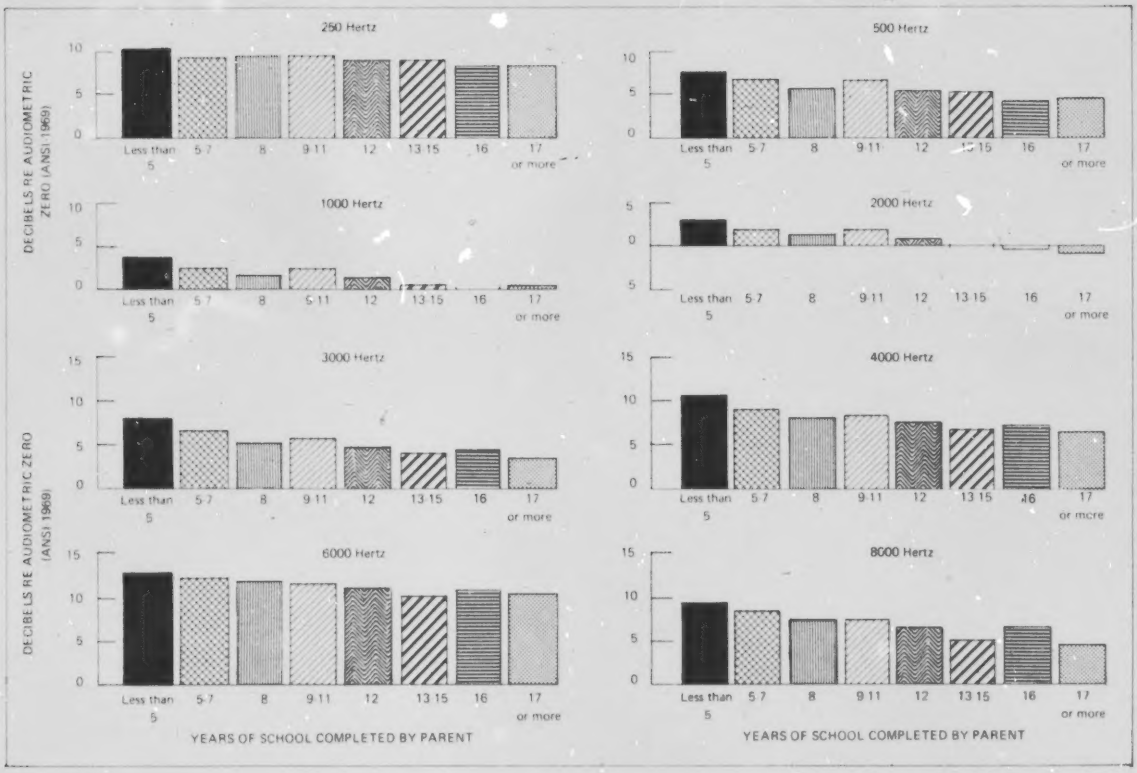

Figure 14. Mean hearing levels of youths 12-17 years at each test frequency, by education of parent: United States, 1966-70.

distributions of these estimates are shown in tables 1, 2, 17-26, 28, 29, and 30.

Most of the youths in this country have estimated thresholds for speech lower than audiometric zero (ASA-1951) as shown in figure 15 and tables 17-19. For 75 percent of the youths this threshold was at least 1.5 decibels below (better than) audiometric zero (ASA-1951). However, in the newer standards only about 25 percent of the youths have estimated hearing thresholds for speech lower than audiometric zero re ANSI-1969 and slightly more than 50 percent had median hearing levels less than 5 decibels above the 1969 American Standard for audiometric zero.

The Committee on Conservation of Hearing proposed a classification of hearing handicap for audiometric survey purposes which contains approximate gradations of impairments that are related solely to pure-tone audiometric measurements but are not related to medical diagnosis and which deliberately disregards the numerous other types of difficulties in understanding speech.[19] (See table F).

The prevalence of hearing handicap for speech among youths in this country, as estimated here, is very low. Less than 1.5 percent or approximately 281,000 youths 12-17 years of age have hearing levels 15 decibels or more above audiometric zero (ASA-1951) within the critical speech range.

Essentially all of these youths fall within the groups who have some difficulty only with faint or normal speech. None had a hearing handicap severe enough to interfere with understanding amplified speech, indicating that the proportion

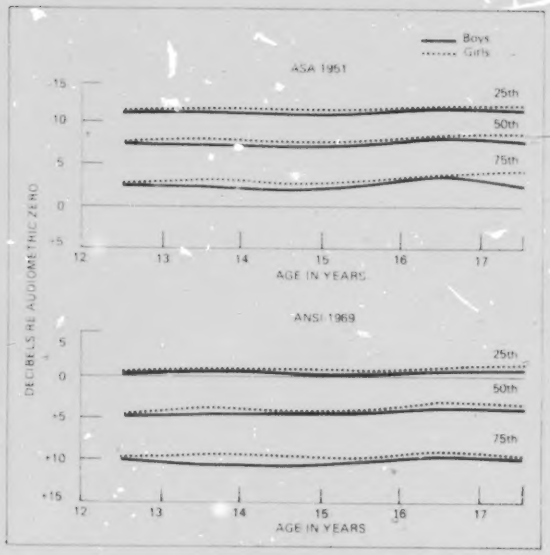

Figure 15. Median and quartiles from the distribution of youths 12-17 years, by hearing threshold levels for speech (average of pure-tone levels at 500, 1000, and 2000 Hertz) in the better ear: United States, 1966-1970.

of youths of this age with this degree of defect is too small to measure reliably with the size of the sample used in this survey.

These estimates of hearing handicap in the youth population will of course be an understatement of the magnitude of the problem since the target population for the survey was limited to the noninstitutionalized and would have excluded youths living in special institutions for the hearing impaired.

At the other extreme, slightly more than 1 percent of youths 12-17 years of age had hearing levels of 15 decibels or more below audiometric zero (ASA-1951) within this range of frequencies considered most essential for speech.

As noted for the individual frequencies comprising the speech reception threshold estimates, similar mean (speech) thresholds were found for boys and girls among these youths as among U.S. children in the 1963-65 study and among the young U.S. adults in the 1960-62 study. However, the prevalence of hearing handicap among youths in this study is slightly higher than among U.S. children—1.3 percent as compared with less than 1 percent or approximately 68,000 more youths than children.

Table F. Estimated percentage of the youth population, by gradation of hearing handicap: United States, 1966-70

Average hearing level in decibels re audiometric zero for 500, 1000, and 2000 Hertz in the better ear		Ability to understand speech	Both sexes	Boys	Girls
ASA-1951	ANSI-1969		Percentage		
Less than 15 dB	Less than 26 dB	No significant difficulty with faint speech	98.76	98.57	98.96
15–29 dB	26–40 dB	Difficulty only with faint speech	1.02	1.19	0.84
30–44 dB	41–55 dB	Frequent difficulty with normal speech	0.19	0.22	0.16
45–59 dB	56–70 dB	Frequent difficulty with loud speech	–	–	–
60–79 dB	71–90 dB	Understands only shouted or amplified speech	•	•	•
80 or more dB	91 or more dB	Usually cannot understand even amplified speech	•	•	•

COMPARISON WITH PREVIOUS STUDIES

The present study is the first in which findings are representative of the junior and senior high-school-age population of the United States. In recent years there have been several large-scale studies which obtained data on hearing thresholds for selected groups of young adults. Some of these studies were limited to the otologically normal and were done specifically to determine hearing level norms. The earliest of these large-scale surveys was the 1935-36 National Health Survey. A more intensive study[20] was recently completed in Pittsburgh, Pennsylvania, during which hearing threshold levels were determined for children in the elementary schools, both public and private. Reference is limited here to studies presenting findings on young adults in which somewhat similar testing methods to those in the present survey were used.

The National Health Survey of 1935-36 provided the basis for obtaining the data used in the 1951 American Standard audiometric zero.[19] In a clinical followup investigation some 9,000 persons of all ages residing in selected cities of the United States were examined and tested. Hearing threshold levels were determined by air-conduction testing at eight pure tones—64, 128, 256, 512, 1024, 2048, 4096, and 8192 Hertz—generated by standard audiometers (Western Electric 2-A, earphone type 552). Testing was done in booths constructed to give effective insulation from ambient noise. The 1951 American Standard (for audiometric zero) was based on hearing thresholds for 1,242 persons determined to be otologically normal. Because of the method used for selecting the study group from these urban communities, the findings cannot be assumed to be representative of the urban population of this country at the time of the study. It is assumed here that threshold levels obtained at 256, 512, 1024, 2048, 4096, and 8192 Hertz are approximately the same as those at the approximate octave frequencies of 250, 500, 1000, 2000, 4000, and 8000 Hertz used in the present study.

Hearing levels for young adults 18-24 years of age based on findings from the 1960-62 Health Examination Survey among a nationally representative sample of adults have been published.[16] This study, as previously indicated, was based on examination findings for nearly 6,700 persons from a national probability sample selected to represent the civilian noninstitutionalized population 18-79 years of age. In the survey examination, threshold levels were determined by air-conduction testing at six pure tones—500, 1000, 2000, 3000, 4000, and 6000 Hertz—generated by standard audiometers with TDH-39 earphones. Testing was done in booths constructed to achieve effective insulation.

Data obtained at the 1955 Wisconsin State Fair have been presented on 122 persons 18-24 years of age considered to be otologically normal.[21] The subjects were drawn from among persons of all ages who attended the fair, primarily from Milwaukee and the surrounding area. Testing was done with standard audiometers by air-conduction (TDH-39 earphones) in prefabricated test rooms at nine tones—125, 250, 500, 1000, 2000, 3000, 4000, 6000, and 8000 Hertz.

From their study in Britain in 1952 Dadson and King published data on 99 persons 18-24 years of age considered to be otologically normal.[22] These subjects who were employees of the National Physical Laboratory were trained, highly motivated listeners. Testing which was done by air-conduction with standard audiometers (4026-A earphones) in a very silent, absorbent room was carried out at 14 pure tone frequencies—80, 125, 250, 500, 1000, 1500, 2000, 3000, 4000, 6000, 8000, 10000, 12000, and 15000 Hertz.

Eagles, et al., at the University of Pittsburgh Graduate School of Public Health, in cooperation with the Committee on Conservation of Hearing of the American Academy of Ophthalmology and Otolaryngology, conducted a study from 1958 to 1960 on a group of 4,078 children in the public and private schools of Pittsburgh, Pennsylvania.[20] The subjects who were between 5 and 14 years of age were a representative

cross section of the Pittsburgh elementary school population. In this study, threshold levels were determined by air-conduction testing at seven pure tones—250, 500, 1000, 2000, 4000, 6000, and 8000 Hertz—generated by standard audiometers with WE-705A earphones in prefabricated test rooms constructed to achieve effective attenuation of ambient noise.

Findings from the various studies cited in this section have been converted to a uniform base (for TDH-39 earphones on the NBS 9-A coupler expressed in decibels re 0.0002 dynes per square centimeter). This is a scale different from that used to present data elsewhere in this report (appendix III). Some factors which cannot be compensated for are differences in acoustical environment, testing technique, stability of the instruments used, and selection and motivation of the test subjects. These are confounded with any real differences that may exist among the populations themselves.

Median hearing levels obtained for U.S. youths in the present study differ substantially from those for the otologically normal group in the 1935-36 National Health Survey whose thresholds were used in determining the 1951 American Standard reference zero (figure 16).[13,23] The levels for youths 12-17 years of age in the present national study are from 10 decibels to less than 2 decibels lower (better), depending on the frequency, than those of the otoscopically normal young adults in the 1935-36 National Health Survey.

Findings from the present survey are in closer agreement with those for more recent studies cited here which present data on hearing levels of young adults and children. The median hearing levels found in the present study differ by no more than 2.5 decibels from the median levels for young U.S. adults 18-24 years of age from the Health Examination Survey findings in 1960-62 and by slightly more than 4 decibels from the median hearing levels for U.S. children 6-11 years of age from the 1963-65 Health Examination Survey findings.

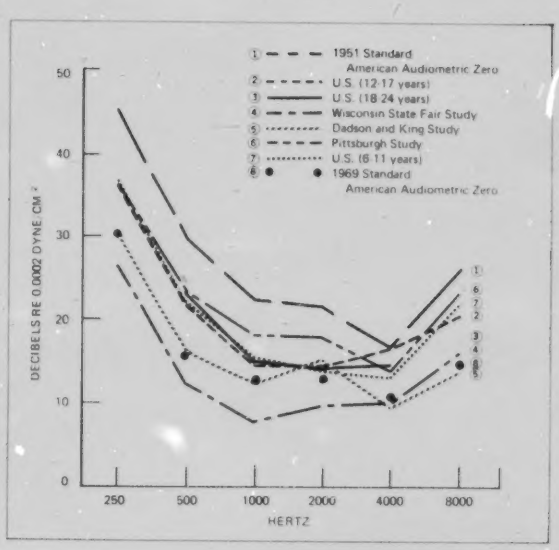

Figure 16. Median hearing threshold levels for right ear (in decibels re 0.0002 dynes per cm^2) for youths and young adults at selected frequencies, from selected studies.

SUMMARY

Hearing threshold levels among youths 12-17 years of age in the noninstitutionalized population of the United States, as determined from the Health Examination Survey of 1966-70, have been described and analyzed in this report. Some findings are presented in decibel units based on the 1951 American Standard and all are shown in units based on the 1969 American Standard for audiometric reference zero. Age, sex, racial, regional, urban-rural, income, and educational differentials in hearing levels are assessed.

For the 1966-70 Health Examination Survey, a probability sample was selected as representative of the 22.7 million civilian noninstitutionalized youths 12-17 years of age in the United States at midsurvey time. Of these, the 6,768 examined, 90 percent of the sample, were closely representative of the youth population from which they were drawn with respect to age, sex, race, region, and other demographic and socioeconomic variables considered in this report.

Comparison is made throughout with the hearing levels among U.S. children 6-11 years of age from the 1963-65 Health Examination Survey and the young U.S. adults 18-24 years of age from the 1960-62 Health Examination Survey.

Major findings from the study among youths include:

1. For their better ear more than half had hearing thresholds below (better than) the ASA 1951 standard for audiometric zero (1951 American Standard) at all frequencies tested except 6000 Hertz.
2. For the better ear less than 50 percent had hearing thresholds below (better than) the ANSI-1969 standard for audiometric zero (1969 American Standard) at all frequencies tested.
3. Hearing was somewhat poorer (in relation to the 1951 American Standard) at 3000, 4000, and 6000 Hertz than at the lower test frequencies.
4. Hearing thresholds for the right ear as compared with the left were dissimilar (by more than 5 decibels) for most of the youths. The extent of agreement tended to diminish with increasing frequency.
5. Hearing levels for girls are generally lower than among boys, by mean differences large enough to be statistically significant at 2000-8000 Hertz.
6. The prevalence of hearing handicap as estimated from the pure-tone audiometric test results in this survey is quite low. Only about 1.5 percent or an estimated 281,000 youths 12-17 years of age in this country have some degree of hearing handicap—mean thresholds of 15 decibels or higher (re 1951 ASA audiometric zero) at frequencies of 500-2000 Hertz; however, this does not include youths residing in special schools for the hearing impaired or in other institutions.
7. Hearing sensitivity of youths showed a generally consistent relationship with family income. Youths from families with less than $5,000 per year had higher mean thresholds (poorer hearing) than those from families with income of $5,000 and over, with mean differences large enough to be statistically significant at all octave frequencies. A similar but less strong relationship was found between hearing levels of youths and parent education.

———— ○ ○ ○ ————

REFERENCES

[1]National Center for Health Statistics: Origin, program, and operation of the U.S. National Health Survey. *Vital and Health Statistics.* PHS Pub. No. 1000-Series 1-No. 1. Public Health Service. Washington. U.S. Government Printing Office, Aug. 1963.

[2]National Center for Health Statistics: Plan and initial program of the Health Examination Survey. *Vital and Health Statistics.* PHS Pub. No. 1000-Series 1-No. 4. Public Health Service. Washington. U.S. Government Printing Office, July 1965.

[3]National Center for Health Statistics: Cycle I of the Health Examination Survey, sample and response, United States, 1960-62. *Vital and Health Statistics.* PHS Pub. No. 1000-Series 11-No. 1. Public Health Service. Washington. U.S. Government Printing Office, Apr. 1964.

[4]National Center for Health Statistics: Plan, operation, and response results of a program of children's examinations. *Vital and Health Statistics.* PHS Pub. No. 1000-Series 1-No. 5. Public Health Service. Washington. U.S. Government Printing Office, Oct. 1967.

[5]National Center for Health Statistics: Sample design and estimation procedures for a National Health Examination of children. *Vital and Health Statistics.* PHS Pub. No. 1000-Series 2-No. 43. Public Health Service. Washington. U.S. Government Printing Office, Aug. 1971.

[6]National Center for Health Statistics: Plan and operation of a Health Examination Survey of U.S. youths 12-17 years of age. *Vital and Health Statistics.* PHS Pub. No. 1000-Series 1-No. 8. Public Health Service. Washington. U.S. Government Printing Office, Sept. 1969.

[7]National Center for Health Statistics: Hearing levels of children by age and sex, United States. *Vital and Health Statistics.* PHS Pub. No. 1000-Series 11-No. 102. Public Health Service. Washington. U.S. Government Printing Office, Feb. 1970.

[8]American Standards Association: *American Standard Specifications for Audiometers for General Diagnostic Purposes.* Pub. No. Z24.5-1951. New York, 1951.

[9]American National Standards Institute: *American Standard Specifications for Audiometers.* Pub. No. S3.6-1969. New York, 1969.

[10]International Organization for Standardization: *ISO Recommendation R 389-Standard Reference Zero for the Calibration of Pure Tone Audiometers.* ISO/R 389-1964 (E). Switzerland, Nov. 1964.

[11]American Standards Association: *American Standard Criteria for Background Noise in Audiometer Rooms.* Pub. No. S3.1-1960. New York, 1960.

[12]National Institutes of Health: Hearing Study Series Bulletins 1-7, The National Health Survey, 1935-36, preliminary reports. Public Health Service. Washington, D.C., 1938.

[13]Corliss, E. L. R., and Snyder, W. F.: Calibration of audiometers. *J. Acoust. Soc. Amer.* 22(6):837-842, Nov. 1950.

[14]National Center for Health Statistics: Loudness balance study of selected audiometer earphones. *Vital and Health Statistics.* PHS Pub. No. 1000-Series 2-No. 40. Public Health Service. Washington. U.S. Government Printing Office, Dec. 1970.

[15]Chaiklin, J. B., and Ventry, I. M.: Functional hearing loss. Ch. 3 in J. Jerger, ed., *Modern Developments in Audiology.* New York. Academic Press, 1963, p. 91.

[16]National Center for Health Statistics: Hearing levels of adults by age and sex, United States, 1960-62. *Vital and Health Statistics.* PHS Pub. No. 1000-Series 11-No. 11. Public Health Service. Washington. U.S. Government Printing Office, Oct. 1965.

[17]Committee on Medical Rating of Physical Impairment: Guide to the evaluation of permanent impairment—ear, nose, throat, and related structures. *J.A.M.A.* 177:489-501, Aug. 19, 1961.

[18]Committee on Conservation of Hearing: Guide for the evaluation of hearing impairment. *Tr. Am. Acad. Ophth.* 63(2), Mar.-Apr. 1959.

[19]National Institutes of Health: Methodological problems in collecting data on the deaf, the survey by E. L. Eagles. *Proceedings—Conference on the Collection of Statistics of Severe Hearing Impairments and Deafness in the United States.* PHS Pub. No. 1227. Public Health Service. Washington. U.S. Government Printing Office, 1964.

[20]Eagles, E. L., Wishik, S. M., Doerfler, L. G., Melnick, W., Levine, H. S.: Hearing sensitivity and related factors in children. *The Laryngoscope.* June 1963.

[21]Glorig, A.: A report of two normal hearing studies. *Ann. Otol. Rhin. & Laryng.* 67(1):93-111, Mar. 1958.

[22]Dadson, R. S., and King, J. H.: A determination of the normal threshold of hearing and its relation to the standardization of audiometers. *J. Laryng. & Otol.* 66:366-378, Aug. 1952.

[23]Burkhard, M. D., and Corliss, E. L. R.: The response of earphones in ears and couplers. *J. Acoust. Soc. Amer.* 26(5):679-685, Sept. 1954.

[24]National Center for Health Statistics: Quality control in a National Health Examination Survey. *Vital and Health Statistics.* Series 2-No. 44. DHEW Pub. No. (HSM) 72-1023. Health Services and Mental Health Administration. Washington. U.S. Government Printing Office. Feb. 1972.

[25]Personal communication from Allison Laboratories and used in Cox, J. R., and Bilger, R. C.: Suggestion relative to the standardization of loudness balance data for Telephonics TDH-39 earphone. *J. Acoust. Soc. Amer.* 32:1081-1082, Aug. 1960.

[26]Davis, H., and Kranz, F. W.: The international standard reference zero for pure-tone audiometers and its relation to the evaluation of impairment of hearing. *J. Speech Hear. Res.* 7(1):7-16, Mar. 1964.

[27]Davis, H.: The ISO Zero-reference level for audiometers. *Arch. Otolaryng.* 81:145-199, Feb. 1965.

[28]Glorig, A.: Audiometric reference levels. *Laryngoscope.* 76:842-849, May 1966.

[29]Weissler, P.: International standard reference zero for audiometers. *J. Acoust. Soc. Amer.* 44(1):264-275, July 1968.

[30]British Standards Institution: *British Standard Specifications for the Normal Threshold of Hearing for Pure Tone by Earphone Listening.* B.S. 2497. London. British Standards House, Inc., 1954.

LIST OF DETAILED TABLES

Table		Page
1.	Mean hearing levels re audiometric zero (ASA-1951) in the better ear of youths at each test frequency and estimates for speech, by race, age, and sex: United States, 1966-70	27
2.	Mean hearing levels re audiometric zero (ANSI-1969) in the better ear of youths at each test frequency and estimates for speech, by race, age, and sex: United States, 1966-70	30
3.	Percent distribution of youths 12-17 years by hearing levels in decibels re audiometric zero (ASA-1951) for the right, left, and better ear at 250, 500, 1000, 2000, 3000, 4000, 6000, and 8000, Hertz: United States, 1966-70	33
4.	Percent distribution of boys 12-17 years by hearing levels in decibels re audiometric zero (ASA-1951) for the right, left, and better ear at 250, 500, 1000, 2000, 3000, 4000, 6000, and 8000 Hertz: United States, 1966-70	34
5.	Percent distribution of girls 12-17 years by hearing levels in decibels re audiometric zero (ASA-1951) for the right, left, and better ear at 250, 500, 1000, 2000, 3000, 4000, 6000, and 8000 Hertz: United States, 1966-70	35
6.	Percent distribution of youths 12-17 years by hearing levels in decibels re audiometric zero (ANSI-1969) for the right, left, and better ear at 250, 500, 1000, 2000, 3000, 4000, 6000, and 8000 Hertz: United States, 1966-70	36
7.	Percent distribution of boys 12-17 years by hearing levels in decibels re audiometric zero (ANSI-1969) for the right, left, and better ear at 250, 500, 1000, 2000, 3000, 4000, 6000, and 8000, Hertz: United States, 1966-70	37
8.	Percent distribution of girls 12-17 years by hearing levels in decibels re audiometric zero (ANSI-1969) for the right, left, and better ear at 250, 500, 1000, 2000, 3000, 4000, 6000, and 8000 Hertz: United States, 1966-70	38
9.	Percent distribution of youths by hearing levels in decibels re audiometric zero (ASA-1951 and ANSI-1969) for the better ear at 250 Hertz, according to age and sex: United States, 1966-70	39
10.	Percent distribution of youths by hearing levels in decibels re audiometric zero (ASA-1951 and ANSI-1969) for the better ear at 500 Hertz, according to age and sex: United States, 1966-70	40
11.	Percent distribution of youths by hearing levels in decibels re audiometric zero (ASA-1951 and ANSI-1969) for the better ear at 1000 Hertz, according to age and sex: United States, 1966-70	41
12.	Percent distribution of youths by hearing levels in decibels re auidometric zero (ASA-1951 and ANSI-1969) for the better ear at 2000 Hertz, according to age and sex: United States, 1966-70	42
13.	Percent distribution of youths by hearing levels in decibels re audiometric zero (ASA-1951 and ANSI-1969) for the better ear at 3000 Hertz, according to age and sex: United States, 1966-70	43
14.	Percent distribution of youths by hearing levels in decibels re auidometric zero (ASA-1951 and ANSI-1969) for the better ear at 4000 Hertz, according to age and sex: United States, 1966-70	44
15.	Percent distribution of youths by hearing levels in decibels re audiometric zero (ASA-1951 and ANSI-1969) for the better ear at 6000 Hertz, according to age and sex: United States, 1966-70	45
16.	Percent distribution of youths by hearing levels in decibels re auidometric zero (ASA-1951 and ANSI-1969) for the better ear at 8000 Hertz, according to age and sex: United States, 1966-70	46

List of Detailed Tables—Con.

Table		Page
17.	Median hearing levels in decibels re audiometric zero (ASA-1951 and ANSI-1969) for the right, left, and better ear of youths 12-17 years at each test frequency and estimates for speech, by age: United States, 1966-70	47
18.	Median hearing levels in decibels re audiometric zero (ASA-1951 and ANSI-1969) for the right, left, and better ear of boys 12-17 years at each test frequency and estimates for speech, by age: United States, 1966-70	48
19.	Median hearing levels in decibels re audiometric zero (ASA-1951 and ANSI-1969) for the right, left, and better ear of girls 12-17 years at each test frequency and estimates for speech, by age: United States, 1966-70	49
20.	Medians and quartile points in the distribution of hearing levels in decibels re audiometric zero (ANSI-1969) for the better ear at each test frequency and estimates for speech among white youths, by age and sex: United States, 1966-70	50
21.	Medians and quartile points in the distribution of hearing levels in decibels re audiometric zero (ANSI-1969) for the better ear at each test frequency and estimates for speech among Negro youths, by age and sex: United States, 1966-70	53
22.	Mean hearing levels re audiometric zero (ANSI-1969) at each test frequency and estimates for speech in the better ear among youths by region, age, and sex: United States, 1966-70	56
23.	Medians and quartile points in the distribution of hearing levels in decibels re audiometric zero (ANSI-1969) for the better ear at each test frequency and estimates for speech among youths in the Northeast, by age and sex: United States, 1966-70	59
24.	Medians and quartile points in the distribution of hearing levels in decibels re audiometric zero (ANSI-1969) for the better ear at each test frequency and estimates for speech among youths in the Midwest, by age and sex: United States, 1966-70	62
25.	Medians and quartile points in the distribution of hearing levels in decibels re audiometric zero (ANSI-1969) for the better ear at each test frequency and estimates for speech among youths in the South, by age and sex: United States, 1966-70	65
26.	Medians and quartile points in the distribution of hearing levels in decibels re audiometric zero (ANSI-1969) for the better ear at each test frequency and estimates for speech among youths in the West, by age and sex: United States, 1966-70	68
27.	Mean hearing levels in decibels re audiometric zero (ANSI-1969) for the better ear at each test frequency among youths in urban and rural areas, by age and sex: United States, 1966-70	71
28.	Mean hearing levels in decibels re audiometric zero (ANSI-1969) for the better ear at each test frequency among youths in urban areas, by population size of place of residence, age, and sex: United States, 1966-70	72
29.	Mean hearing levels in decibels re audiometric zero (ANSI-1969) for the better ear at each test frequency and estimates for speech among youths, by rate of population change in place of residence from 1950 to 1960 and age: United States, 1966-70	73
30.	Mean hearing levels in decibels re audiometric zero (ANSI-1969) for the better ear at each test frequency and estimates for speech among youths by annual family income, age, and sex: United States, 1966-70	74
31.	Mean hearing levels in decibels re audiometric zero (ANSI-1969) for the better ear at each test frequency and estimates for speech among youths, by education of parent, age, and sex: United States, 1966-70	75

Table 1. Mean hearing levels re audiometric zero (ASA-1951) in the better ear of youths at each test frequency and estimates for speech, by race, age, and sex: United States, 1966-70

Age and sex	250 Hertz				500 Hertz				1000 Hertz			
	Total	White	Negro	Other	Total	White	Negro	Other	Total	White	Negro	Other
Both sexes	Decibels re audiometric zero (ASA-1951)											
12-17 years . .	-10.0	-10.0	-10.2	-10.6	-8.2	-8.2	-8.0	-7.4	-8.4	-8.5	-7.7	-7.4
12 years	-9.9	-9.9	-9.9	-12.8	-7.8	-7.8	-7.6	-9.6	-8.0	-8.0	-7.8	-10.1
13 years	-9.8	-9.6	-10.6	-8.6	-8.0	-8.2	-7.5	-4.4	-8.2	-8.4	-7.1	-6.7
14 years	-10.3	-10.4	-10.0	-10.4	-8.2	-8.2	-8.0	-5.5	-8.4	-8.5	-8.0	-6.9
15 years	-10.1	-10.0	-10.7	-9.6	-8.2	-8.2	-8.4	-7.6	-8.5	-8.6	-7.8	-5.6
16 years	-10.2	-10.1	-10.0	-16.0	-8.7	-8.7	-8.4	-10.7	-8.5	-8.7	-7.3	-10.2
17 years	-9.7	-9.8	-9.4	-7.4	-8.6	-8.7	-8.3	-6.8	-8.8	-8.8	-8.0	-7.0
Boys												
12-17 years . .	-10.0	-9.9	-11.0	-11.2	-8.0	-8.0	-8.6	-6.0	-8.2	-8.2	-7.9	-6.8
12 years	-10.2	-10.0	-10.7	-14.6	-7.7	-7.7	-7.5	-4.6	-7.8	-7.7	-8.1	-4.6
13 years	-10.1	-9.8	-12.1	-8.9	-8.0	-8.0	-8.6	-3.6	-8.0	-8.0	-7.5	-5.3
14 years	-10.3	-10.3	-10.2	-12.5	-7.8	-7.8	-7.8	-6.2	-8.2	-8.2	-7.8	-9.4
15 years	-10.2	-9.8	-12.5	-11.0	-7.9	-7.6	-9.8	-5.8	-8.4	-8.4	-8.6	-6.4
16 years	-10.0	-10.0	-9.9	-17.4	-8.4	-8.4	-8.6	-10.8	-8.4	-8.5	-7.1	-10.0
17 years	-9.5	-9.4	-10.7	-6.0	-8.6	-8.4	-9.6	-5.3	-8.4	-8.4	-8.2	-5.3
Girls												
12-17 years . .	-10.0	-10.0	-9.2	-9.8	-8.4	-8.6	-7.5	-9.2	-8.6	-8.8	-7.5	-8.2
12 years	-9.6	-9.7	-9.1	-12.2	-8.0	-7.9	-7.8	-11.3	-8.4	-8.4	-7.6	-12.0
13 years	-9.5	-9.6	-9.2	-7.5	-8.1	-8.4	-6.5	-7.5	-8.6	-8.8	-6.8	-12.5
14 years	-10.3	-10.4	-9.9	-2.5	-8.6	-8.7	-8.4	-2.5	-8.6	-8.8	-8.2	2.5
15 years	-10.1	-10.3	-8.9	-8.8	-8.4	-8.6	-7.0	-8.6	-8.6	-9.0	-7.1	-5.2
16 years	-10.2	-10.3	-10.2	-12.5	-9.0	-9.1	-8.3	-10.4	-8.7	-8.9	-7.5	-10.4
17 years	-9.8	-10.1	-8.2	-9.8	-8.8	-9.0	-7.0	-9.2	-9.1	-9.3	-7.8	-9.8

Table 1. Mean hearing levels re audiometric zero (ASA-1951) in the better ear of youths at each test frequency and estimates for speech, by race, age, and sex: United States, 1966-70—Con.

Age and sex	2000 Hertz				3000 Hertz				4000 Hertz			
	Total	White	Negro	Other	Total	White	Negro	Other	Total	White	Negro	Other
Both sexes	Decibels re audiometric zero (ASA-1951)											
12-17 years . .	-8.0	-8.2	-6.8	-7.0	-3.8	-4.1	-1.8	-2.5	-1.1	-1.3	0.0	0.8
12 years.	-8.1	-8.2	-7.0	-7.2	-3.9	-4.3	-1.5	-5.8	-1.2	-1.4	0.0	-1.1
13 years.	-8.1	-8.4	-6.8	-1.9	-3.6	-4.0	-1.2	0.6	-0.8	-1.1	0.8	0.2
14 years.	-8.0	-8.1	-7.0	-4.4	-3.8	-4.2	-1.6	-1.1	-1.4	-1.6	0.4	-2.0
15 years.	-7.8	-8.0	-6.4	-9.3	-3.6	-3.8	-2.0	-0.3	-1.1	-1.2	-0.8	5.5
16 years.	-8.2	-8.4	-6.6	-10.8	-3.9	-4.2	-2.4	-1.4	-1.2	-1.3	-0.7	0.4
17 years.	-8.2	-8.4	-6.4	-6.6	-4.0	-4.2	-2.4	-8.2	-1.0	-1.2	0.6	-3.9
Boys												
12-17 years . .	-7.6	-7.8	-6.7	-7.4	-2.6	-2.8	-1.4	-2.2	0.1	0.1	0.0	1.3
12 years.	-7.4	-7.4	-7.4	-6.6	-2.9	-3.2	-0.8	-7.5	-0.3	-0.3	-0.3	-0.4
13 years.	-7.6	-7.8	-7.0	-4.1	-2.5	-2.7	-1.4	0.2	0.2	0.1	0.8	-0.3
14 years.	-7.6	-7.8	-6.0	-5.0	-2.6	-2.8	-1.3	-0.7	-0.5	-0.6	0.4	-3.2
15 years.	-7.5	-7.6	-6.8	-7.7	-2.4	-2.4	-2.1	-3.0	0.2	0.2	-0.4	17.0
16 years.	-8.0	-8.2	-6.5	-12.5	-2.4	-2.6	-1.2	-2.9	0.2	0.2	-0.2	-4.0
17 years.	-7.6	-7.8	-6.3	-9.1	-3.0	-3.0	-2.2	-9.1	0.8	1.0	0.0	-5.2
Girls												
12-17 years . .	-8.5	-8.8	-6.8	-6.6	-5.0	-5.4	-2.2	-3.0	-2.4	-2.8	0.1	0.0
12 years.	-8.8	-9.1	-6.8	-7.4	-5.0	-5.4	-2.2	-5.1	-2.2	-2.6	0.3	-1.3
13 years.	-8.6	-9.0	-6.4	7.5	-4.8	-5.5	-1.0	2.5	-1.9	-2.4	0.7	2.5
14 years.	-8.3	-8.4	-8.0	-2.5	-5.0	-5.5	-1.8	-2.5	-2.2	-2.6	0.4	2.5
15 years.	-8.2	-8.5	-6.0	-10.2	-4.8	-5.2	-1.8	-2.3	-2.4	-2.6	-1.1	-1.4
16 years.	-8.3	-8.6	-6.8	-6.6	-5.4	-5.8	-3.6	2.2	-2.6	-2.8	-1.2	11.0
17 years.	-8.8	-9.1	-6.6	-2.5	-5.1	-5.5	-2.7	-7.0	-2.9	-3.5	1.2	-2.0

Table 1. Mean hearing levels re audiometric zero (ASA-1951) in the better ear of youths at each test frequency and estimates for speech, by race, age, and sex: United States, 1966-70—Con.

Age and sex	6000 Hertz				8000 Hertz				Speech[1]			
	Total	White	Negro	Other	Total	White	Negro	Other	Total	White	Negro	Other
Both sexes	Decibels re audiometric zero (ASA-1951)											
12-17 years . .	2.0	2.2	0.8	2.5	-7.4	-7.3	-7.8	-10.4	-6.4	-6.4	-5.6	-5.2
12 years	1.2	1.2	0.4	-3.6	-7.1	-6.9	-8.0	-16.0	-6.1	-6.2	-5.6	-7.5
13 years	1.8	2.0	0.6	0.2	-7.0	-7.0	-7.0	-10.8	-6.2	-6.4	-5.2	-1.3
14 years	1.8	2.0	0.9	4.1	-7.5	-7.5	-7.5	-12.0	-6.2	-6.2	-5.8	-4.4
15 years	2.2	2.4	1.0	5.9	-7.2	-7.2	-7.2	-8.6	-6.2	-6.4	-5.4	-4.6
16 years	3.0	3.2	1.1	10.8	-8.0	-7.8	-8.7	-0.5	-6.6	-6.8	-5.4	-9.6
17 years	2.4	2.6	1.1	-3.0	-7.6	-7.5	-8.2	-15.0	-6.6	-6.8	-5.8	-5.1
Boys												
12-17 years . .	3.6	4.0	1.0	2.2	-6.6	-6.4	-8.0	-10.4	-6.0	-6.1	-5.8	-4.9
12 years	2.3	2.8	-0.5	0.4	-6.4	-6.0	-8.2	-23.7	-5.8	-5.8	-5.8	-4.6
13 years	2.8	3.2	0.8	-1.5	-6.2	-6.0	-7.8	-12.7	-6.0	-6.0	-5.7	-1.0
14 years	3.0	3.4	0.6	0.6	-7.2	-7.0	-7.8	-14.4	-5.9	-6.0	-5.3	-6.2
15 years	3.6	3.8	1.3	13.4	-6.4	-6.2	-7.6	0.2	-6.0	-6.0	-6.4	-3.6
16 years	4.8	5.2	2.0	0.8	-6.7	-6.4	-9.3	-6.1	-6.4	-6.5	-5.5	-10.4
17 years	5.0	5.4	2.4	-1.8	-6.8	-6.6	-7.7	-14.8	-6.2	-6.2	-6.2	-5.3
Girls												
12-17 years . .	0.5	0.5	0.6	2.8	-8.2	-8.3	-7.5	-10.4	-6.6	-6.8	-5.3	-5.8
12 years	0.0	-0.2	1.3	-5.1	-7.8	-7.8	-7.8	-13.2	-6.4	-6.6	-5.4	-8.6
13 years	0.6	0.6	0.3	7.5	-7.8	-8.0	-6.2	-2.5	-6.5	-6.8	-4.7	-2.5
14 years	0.6	0.6	1.2	17.5	-7.9	-8.0	-7.2	-2.5	-6.6	-6.6	-6.4	2.5
15 years	0.9	0.9	0.8	1.2	-8.1	-8.2	-6.9	-14.0	-6.5	-6.8	-4.6	-5.2
16 years	1.2	1.2	0.2	34.8	-9.2	-9.4	-8.1	12.6	-6.8	-7.0	-5.3	-7.5
17 years	-0.2	-0.2	-0.2	-4.8	-8.4	-8.4	-8.6	-15.3	-7.0	-7.4	-5.4	-4.8

[1] Average of hearing levels at 500, 1000, and 2000 Hertz.

Table 2. Mean hearing levels re audiometric zero (ANSI-1969) in the better ear of youths at each test frequency and estimates for speech, by race, age, and sex: United States, 1966-70

Age and sex	250 Hertz				500 Hertz				1000 Hertz			
	Total	White	Negro	Other	Total	White	Negro	Other	Total	White	Negro	Other
Both sexes	Decibels re audiometric zero (ANSI-1969)											
12-17 years . .	9.2	9.2	8.8	8.2	5.9	5.9	5.8	6.3	1.6	1.4	2.3	2.6
12 years	9.2	9.4	9.0	4.6	6.4	6.4	6.2	2.9	2.0	2.0	2.2	-0.1
13 years	9.4	9.6	8.2	10.4	6.2	6.2	6.3	9.6	1.8	1.6	2.9	3.3
14 years	8.8	8.7	9.0	8.6	5.8	5.8	6.0	8.5	1.6	1.5	2.0	3.1
15 years	9.0	9.1	8.2	9.4	6.0	6.0	5.6	6.5	1.5	1.4	2.2	4.4
16 years	9.0	9.1	8.8	1.8	5.5	5.6	5.5	2.1	1.4	1.3	2.6	-0.2
17 years	9.4	9.4	9.2	12.6	5.4	5.4	5.4	8.2	1.2	1.2	2.0	3.0
Boys												
12-17 years . .	9.1	9.3	7.8	7.6	6.1	6.2	5.2	7.8	1.8	1.8	2.1	3.2
12 years	9.0	9.2	8.4	5.4	6.6	6.5	6.6	10.4	2.2	2.3	1.9	5.4
13 years	9.2	9.6	6.7	9.8	6.3	6.4	5.2	10.2	2.0	2.0	2.5	4.7
14 years	8.7	8.8	8.7	6.2	6.3	6.3	6.2	7.5	1.8	1.8	2.2	0.6
15 years	9.0	9.3	6.5	7.8	6.2	6.4	4.2	8.0	1.6	1.6	1.4	3.6
16 years	9.2	9.3	8.8	-0.6	5.8	5.9	5.2	1.0	1.6	1.5	2.9	0.0
17 years	9.6	9.8	7.9	14.0	5.6	5.8	4.0	9.7	1.6	1.6	1.8	4.7
Girls												
12-17 years . .	9.2	9.2	9.6	9.0	5.6	5.6	6.4	4.6	1.4	1.2	2.5	1.8
12 years	9.4	9.5	9.6	4.3	6.2	6.3	5.8	0.2	1.6	1.6	2.4	-2.0
13 years	9.7	9.7	9.6	12.5	6.0	5.8	7.3	7.5	1.4	1.1	3.2	-2.5
14 years	8.8	8.7	9.2	17.5	5.4	5.4	5.7	12.5	1.4	1.2	1.8	12.5
15 years	9.0	8.8	10.0	10.4	5.7	5.5	6.9	5.6	1.4	1.0	2.9	4.8
16 years	9.0	9.0	8.9	7.5	5.2	5.1	5.8	4.6	1.3	1.1	2.4	-0.4
17 years	9.2	9.0	10.5	10.2	5.4	5.2	6.6	5.8	0.9	0.7	2.2	0.2

Table 2. Mean hearing levels re audiometric zero (ANSI-1969) in the better ear of youths at each test frequency and estimates for speech, by race, age, and sex: United States, 1966–70—Con.

Age and sex	2000 Hertz				3000 Hertz				4000 Hertz			
	Total	White	Negro	Other	Total	White	Negro	Other	Total	White	Negro	Other
	Decibels re audiometric zero (ANSI-1969)											
Both sexes												
12-17 years . .	1.1	1.0	2.2	1.7	5.3	5.0	7.0	6.2	8.0	7.8	9.0	9.2
12 years.	1.1	1.0	1.8	0.2	5.2	4.9	7.4	1.7	8.0	7.8	8.9	6.4
13 years.	1.1	1.0	2.0	7.1	5.6	5.2	7.6	9.6	8.4	8.2	9.6	9.2
14 years.	1.1	1.0	2.0	4.5	5.2	4.8	7.4	7.9	7.7	7.4	9.4	7.0
15 years.	1.2	1.1	2.6	-0.2	5.6	5.3	7.0	8.7	8.0	7.9	8.2	13.4
16 years.	1.0	0.8	2.2	-3.0	5.2	5.1	6.4	6.4	8.0	7.9	8.2	8.2
17 years.	1.0	0.8	2.2	3.4	5.0	4.9	6.2	1.8	8.0	7.9	9.2	6.1
Boys												
12-17 years . .	1.6	1.4	2.2	1.3	6.5	6.4	7.4	6.6	9.2	9.2	8.9	9.5
12 years.	1.8	1.8	1.8	3.4	6.3	6.0	8.4	2.5	8.9	9.0	8.8	9.6
13 years.	1.6	1.6	1.8	4.6	6.8	6.6	7.3	8.9	9.4	9.4	9.6	8.4
14 years.	1.4	1.2	2.9	3.8	6.4	6.2	7.6	8.0	8.5	8.4	9.4	5.6
15 years.	1.6	1.5	2.2	1.1	6.7	6.6	6.8	11.8	9.2	9.2	8.5	22.9
16 years.	1.2	1.0	2.2	-5.7	6.8	6.6	7.6	3.9	9.2	9.4	8.4	2.8
17 years.	1.6	1.4	2.4	0.9	6.2	6.2	6.4	0.9	9.9	10.1	8.6	4.8
Girls												
12-17 years . .	0.6	0.4	2.1	2.2	4.1	3.7	6.7	5.8	6.8	6.4	9.0	8.8
12 years.	0.4	0.2	1.9	-0.8	4.2	3.8	6.4	1.4	7.0	6.6	9.0	5.2
13 years.	0.6	0.2	2.4	17.5	4.3	3.7	7.8	12.5	7.2	6.9	9.5	12.5
14 years.	0.8	0.7	1.0	7.5	4.0	3.6	7.2	7.5	6.8	6.4	9.4	12.5
15 years.	1.0	0.6	2.9	-1.0	4.4	4.0	7.0	6.8	6.7	6.6	7.8	7.7
16 years.	0.9	0.7	2.4	3.4	3.8	3.5	5.4	12.2	6.6	6.4	8.0	21.0
17 years.	0.4	0.0	2.2	7.5	4.0	3.6	6.0	3.0	6.2	5.6	9.9	8.0

Table 2. Mean hearing levels re audiometric zero (ANSI-1969) in the better ear of youths at each test frequency and estimates for speech, by race, age, and sex: United States, 1966-70—Con.

Age and sex	6000 Hertz				8000 Hertz				Speech[1]			
	Total	White	Negro	Other	Total	White	Negro	Other	Total	White	Negro	Other
Both sexes	Decibels re audiometric zero (ANSI-1969)											
12-17 years . .	11.2	11.4	9.7	10.7	6.7	6.8	6.1	3.2	5.0	5.0	5.6	5.8
12 years.	10.2	10.4	9.2	3.8	7.0	7.3	5.8	-3.6	5.4	5.4	5.6	4.4
13 years.	11.0	11.2	9.3	9.2	7.2	7.3	6.8	3.2	5.2	5.0	6.0	9.6
14 years.	10.9	11.0	9.9	13.1	6.5	6.6	6.4	2.0	5.1	5.0	5.7	7.0
15 years.	11.4	11.5	10.0	13.8	6.8	6.9	6.6	4.8	5.1	5.0	5.8	6.1
16 years.	12.2	12.5	10.0	16.8	6.2	6.4	5.2	12.2	4.8	4.6	5.4	0.4
17 years.	11.4	11.7	9.8	7.0	6.4	6.6	5.5	0.0	4.8	4.7	5.4	6.6
Boys												
12-17 years . .	12.6	13.0	9.9	10.4	7.5	7.8	5.8	3.0	5.4	5.4	5.4	6.1
12 years.	11.4	11.9	8.6	10.4	7.8	8.1	5.9	-8.7	5.8	5.8	5.6	8.4
13 years.	12.0	12.5	9.5	7.3	8.0	8.3	6.0	1.1	5.4	5.4	5.2	9.0
14 years.	12.0	12.4	9.6	9.3	6.8	7.0	6.2	-0.7	5.4	5.2	6.4	5.6
15 years.	12.6	12.9	10.2	19.4	7.6	7.8	6.4	12.4	5.4	5.4	5.0	6.4
16 years.	14.0	14.4	10.8	7.6	7.4	7.9	4.4	5.8	5.0	5.0	5.2	-0.4
17 years.	14.0	14.4	11.0	8.2	7.2	7.4	5.9	0.2	5.2	5.2	4.6	7.5
Girls												
12-17 years . .	9.6	9.6	9.5	11.0	6.0	5.8	6.4	3.4	4.8	4.6	6.0	5.5
12 years.	9.0	9.0	10.0	1.4	6.2	6.4	5.8	-1.8	5.0	4.8	5.7	3.0
13 years.	9.8	9.9	9.2	17.5	6.4	6.2	7.6	12.5	5.0	4.6	6.8	12.5
14 years.	9.8	9.6	10.2	27.5	6.2	6.0	6.8	12.5	4.8	4.8	5.0	12.5
15 years.	10.0	10.1	9.7	10.4	6.0	6.0	7.0	0.2	4.9	4.6	6.6	5.9
16 years.	10.4	10.4	9.2	38.8	5.0	4.8	6.0	27.6	4.5	4.4	5.7	2.5
17 years.	8.9	9.0	8.6	5.2	5.6	5.8	5.1	-0.3	4.4	4.2	6.1	5.2

[1] Average of hearing levels at 500, 1000, and 2000 Hertz.

Table 3. Percent distribution of youths 12-17 years by hearing levels in decibels re audiometric zero (ASA-1951) for the right, left, and better ear at 250, 500, 1000, 2000, 3000, 4000, 6000, and 8000 Hertz: United States 1966-70

Ear and tonal frequency	Hearing levels in decibels										
	All levels	-25 or less	-24 to -15	-14 to -5	-4 to +5	+6 to +15	+16 to +25	+26 to +35	+36 to +45	+46 to +55	+56 or more
	Percent distribution										
Right ear											
250 Hertz	100.0	0.0	12.7	65.2	18.7	2.2	0.6	0.3	0.1	0.1	0.1
500 Hertz	100.0	0.0	5.9	61.0	28.1	3.6	0.7	0.3	0.1	0.2	0.1
1000 Hertz	100.0	0.1	5.5	62.2	26.6	3.8	1.0	0.3	0.1	0.1	0.3
2000 Hertz	100.0	0.0	8.0	54.5	30.6	5.0	0.7	0.6	0.2	0.1	0.3
3000 Hertz	100.0	0.0	2.1	35.2	47.4	11.6	1.8	0.8	0.4	0.3	0.4
4000 Hertz	100.0	-	0.6	22.1	54.6	16.8	2.8	1.2	0.7	0.6	0.6
6000 Hertz	100.0	-	0.7	15.2	42.1	28.4	7.8	2.6	1.2	1.3	0.7
8000 Hertz	100.0	0.6	12.4	39.8	31.8	9.6	2.5	1.3	0.7	0.8	0.5
Left ear											
250 Hertz	100.0	0.1	10.7	58.3	26.9	2.9	0.8	0.2	0.1	0.0	0.0
500 Hertz	100.0	0.0	5.1	59.6	29.6	4.3	0.8	0.4	0.1	0.1	0.0
1000 Hertz	100.0	0.0	4.8	59.7	29.6	4.1	1.2	0.3	0.1	0.1	0.1
2000 Hertz	100.0	0.1	7.0	51.4	33.7	5.7	1.3	0.4	0.2	0.1	0.1
3000 Hertz	100.0	0.0	1.5	32.3	48.1	13.6	2.4	1.1	0.5	0.2	0.3
4000 Hertz	100.0	0.0	0.3	16.8	52.4	22.9	4.1	1.6	0.7	0.6	0.6
6000 Hertz	100.0	0.0	0.4	11.8	39.1	32.1	10.2	3.1	1.2	1.3	0.8
8000 Hertz	100.0	0.5	11.3	39.1	33.5	9.8	2.9	1.3	0.6	0.6	0.4
Better ear											
250 Hertz	100.0	0.1	17.2	67.1	14.1	1.0	0.3	0.2	-	0.0	0.0
500 Hertz	100.0	0.1	8.9	66.9	21.5	2.1	0.3	0.2	0.0	0.0	0.0
1000 Hertz	100.0	0.1	8.6	69.0	19.6	2.0	0.5	0.2	0.0	0.0	0.0
2000 Hertz	100.0	0.1	12.2	60.6	23.3	3.0	0.4	0.3	0.1	0.0	0.0
3000 Hertz	100.0	0.0	3.0	44.8	42.8	7.5	1.0	0.5	0.2	0.1	0.1
4000 Hertz	100.0	0.0	0.8	29.9	54.7	11.3	1.8	0.7	0.3	0.3	0.2
6000 Hertz	100.0	0.0	1.0	21.3	47.5	22.9	4.7	1.0	0.7	0.6	0.3
8000 Hertz	100.0	1.0	18.1	47.0	26.3	5.1	1.2	0.5	0.3	0.3	0.2

Table 4. Percent distribution of boys 12-17 years by hearing levels in decibels re audiometric zero (ASA-1951) for the right, left, and better ear at 250, 500, 1000, 2000, 3000, 4000, 6000, and 8000 Hertz: United States, 1966-70

Ear and tonal frequency	Hearing levels in decibels										
	All levels	-25 or less	-24 to -15	-14 to -5	-4 to +5	+6 to +15	+16 to +25	+26 to +35	+36 to +45	+46 to +55	+56 or more
	Percent distribution										
Right ear											
250 Hertz	100.0	0.1	12.0	66.3	18.5	1.9	0.6	0.4	0.1	0.1	0.0
500 Hertz	100.0	0.1	5.0	61.0	28.5	3.8	1.0	0.3	0.1	0.1	0.1
1000 Hertz	100.0	0.1	5.4	61.7	27.1	3.8	1.2	0.3	0.1	0.1	0.2
2000 Hertz	100.0	0.1	8.0	53.3	30.4	6.2	0.7	0.8	0.2	0.1	0.2
3000 Hertz	100.0	0.0	1.4	31.0	49.6	13.2	2.4	1.1	0.6	0.3	0.4
4000 Hertz	100.0	-	0.4	19.1	54.3	17.9	3.7	1.7	1.2	0.8	0.9
6000 Hertz	100.0	-	0.3	13.1	38.3	30.9	8.9	3.4	1.9	2.1	1.1
8000 Hertz	100.0	0.4	11.5	37.8	32.0	10.7	3.2	1.6	1.0	1.1	0.7
Left ear											
250 Hertz	100.0	0.1	10.6	58.8	26.7	2.8	0.6	0.3	0.1	-	0.0
500 Hertz	100.0	0.1	4.7	57.9	31.7	4.3	0.8	0.4	0.0	0.1	0.0
1000 Hertz	100.0	-	4.1	58.2	31.2	4.4	1.4	0.4	0.1	0.1	0.1
2000 Hertz	100.0	0.0	6.3	48.9	34.7	7.2	1.8	0.6	0.3	0.1	0.1
3000 Hertz	100.0	0.0	0.9	26.4	50.0	16.3	3.3	1.6	0.8	0.4	0.3
4000 Hertz	100.0	-	0.2	13.6	49.9	25.5	5.4	2.4	1.1	0.9	1.0
6000 Hertz	100.0	0.0	0.2	9.4	36.0	33.1	12.3	4.2	1.6	1.9	1.3
8000 Hertz	100.0	0.6	10.4	36.6	33.7	10.4	4.1	1.8	0.8	0.9	0.7
Better ear											
250 Hertz	100.0	0.1	16.7	68.5	13.4	0.8	0.3	0.2	-	-	0.0
500 Hertz	100.0	0.1	8.0	67.0	22.2	2.0	0.5	0.2	-	-	0.0
1000 Hertz	100.0	0.1	8.0	68.2	20.8	1.9	0.7	0.3	0.0	0.0	-
2000 Hertz	100.0	0.1	11.3	59.1	24.3	4.1	0.6	0.4	0.1	-	0.0
3000 Hertz	100.0	0.0	2.0	39.2	47.3	8.9	1.4	0.8	0.2	0.1	0.1
4000 Hertz	100.0	-	0.6	25.8	55.8	12.9	2.6	1.1	0.4	0.4	0.4
6000 Hertz	100.0	0.0	0.5	18.1	45.9	25.8	5.8	1.3	1.1	0.9	0.6
8000 Hertz	100.0	0.9	17.1	45.6	27.1	5.8	1.8	0.5	0.4	0.4	0.4

Table 5. Percent distribution of girls 12-17 years by hearing levels in decibels re audiometric zero (ASA-1951) for the right, left, and better ear at 250, 500, 1000, 2000, 3000, 4000, 6000, and 8000 Hertz: United States, 1966-70

Ear and tonal frequency	Hearing levels in decibels										
	All levels	-25 or less	-24 to -15	-14 to -5	-4 to +5	+6 to +15	+16 to +25	+26 to +35	+36 to +45	+46 to +55	+56 or more
	Percent distribution										
Right ear											
250 Hertz	100.0	0.0	13.3	64.1	18.8	2.6	0.6	0.2	0.2	0.0	0.2
500 Hertz	100.0	-	6.8	61.0	27.6	3.2	0.5	0.3	0.2	0.2	0.2
1000 Hertz	100.0	0.1	5.7	62.9	26.0	3.7	0.8	0.3	0.1	0.1	0.3
2000 Hertz	100.0	-	8.0	56.7	30.8	3.7	0.7	0.5	0.2	0.1	0.3
3000 Hertz	100.0	0.0	2.8	39.5	45.0	10.0	1.2	0.5	0.3	0.3	0.4
4000 Hertz	100.0	-	0.7	25.1	54.8	15.7	1.9	0.7	0.3	0.4	0.4
6000 Hertz	100.0	-	1.1	17.3	45.9	25.8	6.8	1.7	0.5	0.6	0.3
8000 Hertz	100.0	0.8	13.4	41.9	31.6	8.5	1.8	0.9	0.3	0.5	0.3
Left ear											
250 Hertz	100.0	0.0	10.7	57.8	27.0	3.1	1.0	0.2	0.1	0.1	-
500 Hertz	100.0	0.0	5.5	61.4	27.4	4.4	0.8	0.3	0.1	0.1	-
1000 Hertz	100.0	0.0	5.5	61.2	28.0	3.9	0.8	0.2	0.1	0.1	0.2
2000 Hertz	100.0	0.2	7.8	53.9	32.6	4.1	0.8	0.2	0.2	0.1	0.1
3000 Hertz	100.0	0.0	2.1	38.4	46.1	10.8	1.5	0.6	0.2	0.1	0.2
4000 Hertz	100.0	0.0	0.4	20.1	55.0	20.2	2.7	0.7	0.3	0.3	0.2
6000 Hertz	100.0	0.0	0.5	14.2	42.4	31.1	8.1	2.1	0.7	0.6	0.3
8000 Hertz	100.0	0.5	12.2	41.6	33.2	9.1	1.6	0.8	0.4	0.4	0.2
Better ear											
250 Hertz	100.0	0.1	17.8	65.7	14.7	1.3	0.3	0.1	0.0	0.0	-
500 Hertz	100.0	-	9.9	66.7	20.8	2.2	0.2	0.1	0.1	0.0	-
1000 Hertz	100.0	0.1	9.2	69.9	18.2	2.1	0.4	0.1	-	0.0	0.0
2000 Hertz	100.0	0.1	13.1	62.1	22.2	1.8	0.3	0.2	0.1	0.0	0.1
3000 Hertz	100.0	0.0	4.1	50.5	38.2	6.1	0.6	0.3	0.1	0.0	0.1
4000 Hertz	100.0	0.0	1.1	34.1	53.6	9.7	1.0	0.3	0.0	0.2	-
6000 Hertz	100.0	0.0	1.5	24.5	49.3	19.9	3.5	0.8	0.3	0.2	0.0
8000 Hertz	100.0	1.1	19.1	48.5	25.5	4.4	0.6	0.4	0.2	0.2	0.0

Table 6. Percent distribution of youths 12-17 years by hearing levels in decibels re audiometric zero (ANSI-1969) for the right, left, and better ear at 250, 500, 1000, 2000, 3000, 4000, 6000, and 8000 Hertz: United States, 1966-70

Ear and tonal frequency	Hearing levels in decibels										
	All levels	-25 or less	-24 to -15	-14 to -5	-4 to +5	+6 to +15	+16 to +25	+26 to +35	+36 to +45	+46 to +55	+56 or more
	Percent distribution										
Right ear											
250 Hertz	100.0	-	-	0.5	18.2	61.0	17.0	2.2	0.5	0.3	0.3
500 Hertz	100.0	-	-	0.6	37.4	52.1	7.7	1.4	0.3	0.1	0.4
1000 Hertz	100.0	-	0.1	5.5	62.2	26.6	3.8	1.0	0.3	0.1	0.4
2000 Hertz	100.0	-	0.1	9.8	57.5	26.7	4.1	0.6	0.6	0.2	0.4
3000 Hertz	100.0	-	0.0	2.4	39.6	45.3	9.5	1.4	0.8	0.3	0.7
4000 Hertz	100.0	-	0.0	1.0	26.6	52.0	14.7	2.7	1.1	0.7	1.2
6000 Hertz	100.0	-	-	1.1	17.2	43.3	26.1	6.8	2.4	1.1	2.0
8000 Hertz	100.0	0.0	0.1	4.6	29.9	39.3	17.8	4.5	1.5	0.7	1.6
Left ear											
250 Hertz	100.0	-	0.0	0.6	16.6	53.5	25.4	2.8	0.8	0.2	0.1
500 Hertz	100.0	-	0.0	0.6	34.8	52.6	9.8	1.4	0.5	0.2	0.1
1000 Hertz	100.0	-	0.0	4.8	59.7	29.6	4.1	1.2	0.3	0.1	0.2
2000 Hertz	100.0	0.0	0.1	9.1	54.1	30.1	4.6	1.2	0.4	0.2	0.2
3000 Hertz	100.0	-	0.0	1.8	36.2	46.5	11.5	2.1	1.0	0.4	0.5
4000 Hertz	100.0	-	0.0	0.6	20.8	50.9	20.6	3.7	1.5	0.7	1.2
6000 Hertz	100.0	0.0	0.0	0.6	14.2	40.8	29.3	9.0	3.0	1.1	2.0
8000 Hertz	100.0	-	0.1	4.3	28.4	40.8	17.9	4.7	1.6	1.0	1.2
Better ear											
250 Hertz	100.0	-	0.0	0.9	23.2	61.6	12.9	1.0	0.2	0.2	0.0
500 Hertz	100.0	-	0.0	1.1	46.9	46.0	5.1	0.7	0.1	0.1	0.0
1000 Hertz	100.0	-	0.1	8.6	69.0	19.5	2.0	0.5	0.2	0.0	0.1
2000 Hertz	100.0	0.0	0.2	15.1	62.0	19.6	2.4	0.4	0.3	0.0	0.0
3000 Hertz	100.0	-	0.0	3.6	49.5	39.6	5.8	0.7	0.5	0.1	0.2
4000 Hertz	100.0	-	0.0	1.6	34.8	50.7	9.8	1.6	0.7	0.3	0.5
6000 Hertz	100.0	0.0	0.0	1.4	24.1	47.7	20.1	4.1	1.0	0.7	0.9
8000 Hertz	100.0	0.0	0.2	7.3	38.8	39.2	10.6	2.3	0.6	0.4	0.6

Table 7. Percent distribution of boys 12-17 years by hearing levels in decibels re audiometric zero (ANSI-1969) for the right, left, and better ear at 250, 500, 1000, 2000, 3000, 4000, 6000, and 8000 Hertz: United States, 1966-70

Ear and tonal frequency	Hearing levels in decibels										
	All levels	-25 or less	-24 to -15	-14 to -5	-4 to +5	+6 to +15	+16 to +25	+26 to +35	+36 to +45	+46 to +55	+56 or more
	Percent distribution										
Right ear											
250 Hertz	100.0	-	-	0.7	17.4	62.1	16.9	1.8	0.5	0.4	0.2
500 Hertz	100.0	-	-	0.5	35.9	53.1	8.4	1.6	0.2	0.1	0.2
1000 Hertz	100.0	-	0.1	5.4	61.7	27.1	3.9	1.2	0.3	0.0	0.3
2000 Hertz	100.0	-	0.1	9.7	56.1	27.1	5.2	0.5	0.8	0.2	0.3
3000 Hertz	100.0	-	0.0	1.5	34.8	48.3	11.2	1.8	1.1	0.5	0.8
4000 Hertz	100.0	-	-	0.8	23.6	51.9	15.8	3.5	1.6	1.2	1.6
6000 Hertz	100.0	-	-	0.5	15.0	40.0	28.5	7.8	3.2	1.8	3.2
8000 Hertz	100.0	0.0	0.0	4.1	28.7	38.3	18.1	5.5	1.9	1.0	2.4
Left ear											
250 Hertz	100.0	-	-	0.7	16.1	54.5	25.0	2.7	0.6	0.3	0.1
500 Hertz	100.0	-	0.1	0.7	31.8	55.6	9.7	1.4	0.5	0.1	0.1
1000 Hertz	100.0	-	-	4.1	58.2	31.2	4.4	1.4	0.4	0.1	0.2
2000 Hertz	100.0	-	0.0	8.2	51.8	31.4	5.9	1.6	0.6	0.3	0.2
3000 Hertz	100.0	-	-	1.1	30.0	49.1	14.1	3.0	1.3	0.7	0.7
4000 Hertz	100.0	-	-	0.4	17.4	48.9	23.2	4.9	2.2	1.1	1.9
6000 Hertz	100.0	0.0	-	0.4	11.4	38.2	30.3	11.1	4.0	1.5	3.1
8000 Hertz	100.0	-	0.1	4.0	26.2	39.5	18.8	5.9	2.3	1.4	1.8
Better ear											
250 Hertz	100.0	-	-	1.1	22.1	63.4	12.2	0.8	0.2	0.2	0.0
500 Hertz	100.0	-	0.1	1.0	44.4	48.4	5.1	0.7	0.2	0.1	0.0
1000 Hertz	100.0	-	0.1	8.0	68.2	20.8	1.9	0.7	0.3	0.0	0.0
2000 Hertz	100.0	-	0.1	14.0	60.7	21.0	3.2	0.5	0.4	0.1	0.0
3000 Hertz	100.0	-	0.0	2.3	43.8	44.5	7.2	1.0	0.7	0.2	0.3
4000 Hertz	100.0	-	-	1.1	30.7	51.9	11.5	2.4	1.0	0.5	0.9
6000 Hertz	100.0	0.0	-	0.7	21.1	46.4	22.8	5.1	1.2	1.1	1.6
8000 Hertz	100.0	0.0	0.1	6.8	37.5	39.0	11.2	3.1	0.8	0.5	1.0

Table 8. Percent distribution of girls 12–17 years by hearing levels in decibels re audiometric zero (ANSI–1969) for the right, left, and better ear at 250, 500, 1000, 2000, 3000, 4000, 6000, and 8000 Hertz: United States, 1966–70

Ear and tonal frequency	Hearing levels in decibels										
	All levels	-25 or less	-24 to -15	-14 to -5	-4 to +5	+6 to +15	+16 to +25	+26 to +35	+36 to +45	+46 to +55	+56 or more
	Percent distribution										
Right ear											
250 Hertz	100.0	-	-	0.4	19.1	59.9	17.0	2.5	0.5	0.2	0.4
500 Hertz	100.0	-	-	0.8	38.9	51.1	7.1	1.1	0.4	0.1	0.5
1000 Hertz	100.0	-	0.1	5.7	62.9	25.9	3.7	0.8	0.3	0.1	0.5
2000 Hertz	100.0	-	0.0	10.0	58.9	26.4	3.1	0.7	0.4	0.1	0.4
3000 Hertz	100.0	-	0.0	3.3	44.4	42.2	7.7	1.0	0.5	0.2	0.7
4000 Hertz	100.0	-	0.0	1.3	29.7	52.2	13.5	1.8	0.6	0.2	0.7
6000 Hertz	100.0	-	-	1.6	19.4	46.6	23.7	5.8	1.6	0.4	0.9
8000 Hertz	100.0	-	0.2	5.1	31.0	40.3	17.5	3.5	1.2	0.3	0.9
Left ear											
250 Hertz	100.0	-	0.0	0.5	17.1	52.4	25.7	2.9	1.0	0.2	0.2
500 Hertz	100.0	-	-	0.4	37.9	49.5	10.0	1.4	0.4	0.2	0.2
1000 Hertz	100.0	-	0.0	5.5	61.2	28.0	3.9	0.8	0.2	0.1	0.3
2000 Hertz	100.0	0.0	0.2	10.1	56.4	28.7	3.3	0.7	0.2	0.2	0.2
3000 Hertz	100.0	-	0.0	2.5	42.6	44.0	8.8	1.1	0.6	0.1	0.3
4000 Hertz	100.0	-	0.0	0.9	24.2	52.9	17.9	2.5	0.8	0.4	0.4
6000 Hertz	100.0	-	0.0	0.7	17.0	43.6	28.3	6.9	2.0	0.7	0.8
8000 Hertz	100.0	-	0.1	4.6	30.7	42.1	16.9	3.5	0.8	0.6	0.7
Better ear											
250 Hertz	100.0	-	0.0	0.8	24.2	59.7	13.7	1.2	0.3	0.1	0.0
500 Hertz	100.0	-	-	1.1	49.4	43.6	5.0	0.7	0.0	0.1	0.1
1000 Hertz	100.0	-	0.1	9.2	69.8	18.2	2.1	0.4	0.1	-	0.1
2000 Hertz	100.0	0.0	0.2	16.2	63.4	18.2	1.4	0.2	0.3	-	0.1
3000 Hertz	100.0	-	0.0	4.9	55.3	34.5	4.4	0.4	0.3	0.1	0.1
4000 Hertz	100.0	-	0.1	2.0	39.0	49.5	8.1	0.8	0.3	0.1	0.1
6000 Hertz	100.0	-	0.0	2.2	27.2	49.1	17.3	3.0	0.7	0.3	0.2
8000 Hertz	100.0	-	0.3	7.8	40.2	39.4	9.9	1.4	0.5	0.3	0.2

Table 9. Percent distribution of youths by hearing levels in decibels re audiometric zero (ASA-1951 and ANSI-1969) for the better ear at 250 Hertz, according to age and sex: United States, 1966-70.

Sex and hearing levels in decibels	Total, 12-17 years	12 years	13 years	14 years	15 years	16 years	17 years	Total, 12-17 years	12 years	13 years	14 years	15 years	16 years	17 years
	Percent distribution (ASA-1951)							Percent distribution (ANSI-1969)						
Both sexes														
All levels	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
-25 or less	0.1	0.2	0.1	0.3	–	–	–	–	–	–	–	–	–	–
-24 to -15	17.2	17.9	17.5	17.6	18.8	16.0	15.4	0.0	–	–	0.1	–	–	–
-14 to -05	67.1	65.6	64.8	68.3	65.5	70.2	68.7	0.9	1.1	1.0	1.1	0.7	1.0	0.6
-04 to +05	14.1	14.6	15.9	12.8	14.5	12.3	14.1	23.2	23.0	21.9	24.1	25.8	22.0	21.9
+06 to +15	1.0	1.3	1.4	0.7	0.6	1.1	1.1	61.6	61.0	60.8	62.4	58.6	63.7	63.0
+16 to +25	0.3	0.3	0.2	0.2	0.5	0.1	0.2	12.9	13.2	14.7	11.2	13.7	11.8	12.8
+26 to +35	0.2	0.1	–	0.1	0.1	0.2	0.5	1.0	1.3	1.3	0.7	0.7	1.1	1.1
+36 and greater	0.0	0.0	0.1	–	–	0.1	–	0.4	0.4	0.3	0.4	0.5	0.4	0.6
Boys														
All levels	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
-25 or less	0.1	0.2	0.1	0.3	–	–	–	–	–	–	–	–	–	–
-24 to -15	16.7	19.5	17.4	15.3	18.3	15.1	14.0	–	–	–	–	–	–	–
-14 to -05	68.5	65.9	66.7	72.8	65.6	71.5	68.9	1.1	0.8	1.4	1.2	1.3	1.2	0.5
-04 to +05	13.4	13.2	15.2	10.5	14.7	12.2	14.8	22.1	24.5	20.4	22.5	24.0	20.3	20.6
+06 to +15	0.8	0.7	0.5	0.9	0.8	0.8	1.0	63.4	61.4	63.7	66.8	59.5	65.6	63.4
+16 to +25	0.3	0.3	0.1	0.1	0.6	–	0.5	12.2	12.1	13.9	8.4	13.8	11.7	13.2
+26 to +35	0.2	0.1	–	0.1	–	0.4	0.8	0.8	0.8	0.5	0.9	0.9	0.8	1.3
+36 and greater	0.0	0.1	–	–	–	–	–	0.4	0.4	0.1	0.2	0.5	0.4	1.0
Girls														
All levels	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
-25 or less	0.1	0.2	0.1	0.2	–	–	–	–	–	–	–	–	–	–
-24 to -15	17.8	16.1	17.7	19.9	19.4	16.9	16.8	0.0	–	–	0.2	–	–	–
-14 to -05	65.7	65.3	62.8	63.6	65.3	69.0	68.5	0.8	1.4	0.6	1.1	0.1	0.7	0.7
-04 to +05	14.7	16.1	16.5	15.3	14.3	12.4	13.4	24.2	21.5	23.6	25.7	27.5	23.8	23.3
+06 to +15	1.3	1.9	2.4	0.5	0.4	1.4	1.1	59.7	60.7	57.7	58.0	57.8	61.7	62.6
+16 to +25	0.3	0.4	0.4	0.3	0.3	0.2	–	13.7	14.3	15.6	14.0	13.6	12.0	12.3
+26 to +35	0.1	–	–	0.2	0.3	–	0.2	1.2	1.7	2.1	0.5	0.4	1.5	0.9
+36 and greater	0.0	–	0.1	–	–	0.1	–	0.4	0.4	0.4	0.5	0.6	0.3	0.2

Table 10. Percent distribution of youths by hearing levels in decibels re audiometric zero (ASA-1951 and ANSI-1969) for the better ear at 500 Hertz, according to age and sex: United States, 1966-70

Sex and hearing levels in decibels	Total, 12-17 years	12 years	13 years	14 years	15 years	16 years	17 years	Total, 12-17 years	12 years	13 years	14 years	15 years	16 years	17 years
Both sexes	Percent distribution (ASA-1951)							Percent distribution (ANSI-1969)						
All levels	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
-25 or less	0.0	–	0.1	0.1	0.1	0.1	–	–	–	–	–	–	–	–
-24 to -15	8.9	8.4	8.5	7.9	8.1	9.9	10.9	0.0	–	–	0.1	0.1	–	–
-14 to -05	66.9	64.8	64.7	67.5	67.1	69.3	68.3	1.1	1.2	1.1	0.9	0.4	1.7	1.0
-04 to +05	21.5	23.0	23.9	22.0	22.5	18.8	18.5	46.9	44.5	45.3	46.7	47.7	47.7	49.9
+06 to +15	2.1	3.2	2.3	2.3	1.7	1.2	1.6	46.0	46.2	47.0	46.5	46.0	46.0	44.2
+16 to +25	0.3	0.2	0.3	0.1	0.2	0.5	0.6	5.1	7.0	5.6	5.2	4.9	3.4	4.2
+26 to +35	0.2	0.2	0.1	0.1	0.3	0.1	0.1	0.7	0.7	0.8	0.5	0.6	0.9	0.5
+36 and greater	0.1	0.2	0.1	–	–	0.1	–	0.2	0.4	0.2	0.1	0.3	0.3	0.2
Boys														
All levels	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
-25 or less	0.1	–	0.2	0.1	0.2	0.2	–	–	–	–	–	–	–	–
-24 to -15	8.0	8.2	7.8	6.2	7.4	8.7	9.9	0.1	–	–	0.1	0.2	–	–
-14 to -05	67.0	64.1	65.0	68.2	65.9	70.5	69.1	1.0	1.0	1.4	0.4	0.1	2.3	0.8
-04 to +05	22.2	24.5	24.4	22.6	24.3	18.5	18.3	44.4	42.5	42.5	43.8	45.2	42.4	50.8
+06 to +15	2.0	2.4	2.5	2.6	1.7	1.0	1.5	48.4	48.7	49.5	48.6	48.5	51.0	44.0
+16 to +25	0.5	0.4	–	0.2	0.1	0.9	1.2	5.1	6.8	5.8	6.6	5.1	3.0	3.2
+26 to +35	0.2	0.3	0.1	0.1	0.4	0.2	–	0.7	0.5	0.7	0.4	0.5	0.9	1.0
+36 and greater	0.0	0.1	–	–	–	–	–	0.3	0.5	0.1	0.1	0.4	0.4	0.2
Girls														
All levels	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
-25 or less	–	–	–	–	–	–	–	–	–	–	–	–	–	–
-24 to -15	9.9	8.7	9.3	9.7	8.8	11.2	11.8	–	–	–	–	–	–	–
-14 to -05	66.7	65.5	64.3	66.8	68.4	68.0	67.5	1.1	1.5	0.7	1.5	0.7	1.2	1.2
-04 to +05	20.8	21.5	23.3	21.5	20.6	19.1	18.7	49.4	46.5	48.2	49.6	50.2	53.1	49.0
+06 to +15	2.2	4.1	2.1	1.9	1.6	1.4	1.8	43.6	43.6	44.4	44.3	43.5	40.8	44.5
+16 to +25	0.2	–	0.7	–	0.3	–	–	5.0	7.2	5.4	3.9	4.7	3.8	5.1
+26 to +35	0.1	–	0.2	0.1	0.3	–	0.2	0.7	1.0	1.0	0.6	0.6	0.8	–
+36 and greater	0.1	0.2	0.1	–	–	0.3	–	0.2	0.2	0.3	0.1	0.3	0.3	0.2

Table 11. Percent distribution of youths by hearing levels in decibels re audiometric zero (ASA-1951 and ANSI-1969) for the better ear at 1000 Hertz, according to age and sex: United States, 1966-70

Sex and hearing levels in decibels	Total, 12-17 years	12 years	13 years	14 years	15 years	16 years	17 years	Total, 12-17 years	12 years	13 years	14 years	15 years	16 years	17 years
Both sexes	Percent distribution (ASA-1951)							Percent distribution (ANSI-1969)						
All levels	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
-25 or less	0.1	0.2	–	0.4	–	–	–	–	–	–	–	–	–	–
-24 to -15	8.6	8.7	9.8	7.2	8.7	8.3	8.7	0.1	0.2	–	0.4	–	–	–
-14 to -05	69.0	66.8	66.0	69.6	70.0	71.3	71.0	8.6	8.7	9.8	7.2	8.7	8.3	8.7
-04 to +05	19.5	20.8	20.9	20.5	19.0	17.7	18.0	69.0	66.7	66.0	69.6	70.0	71.4	71.0
+06 to +15	2.0	2.5	2.2	2.0	1.9	1.6	1.8	19.6	20.8	20.9	20.5	19.0	17.7	18.0
+16 to +25	0.5	0.8	0.7	0.3	0.2	0.6	0.5	2.0	2.5	2.2	2.0	1.9	1.6	1.8
+26 to +35	0.2	0.1	0.4	0.0	0.1	0.4	–	0.5	0.8	0.7	0.3	0.2	0.6	0.5
+36 and greater	0.1	0.1	0.0	–	0.1	0.1	–	0.2	0.3	0.4	0.0	0.2	0.4	–
Boys														
All levels	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
-25 or less	0.1	–	–	0.6	–	–	–	–	–	–	–	–	–	–
-24 to -15	8.0	7.4	9.2	5.9	8.2	8.8	8.5	0.1	–	–	0.6	–	–	–
-14 to -05	68.2	67.5	64.2	69.1	69.3	69.7	70.0	8.0	7.4	9.2	5.9	8.2	8.8	8.5
-04 to +05	20.8	21.8	23.1	22.2	20.2	18.2	18.8	68.2	67.5	64.2	69.1	69.3	69.7	70.0
+06 to +15	1.9	2.1	2.4	1.5	2.0	1.8	1.8	20.8	21.8	23.1	22.2	20.2	18.2	18.8
+16 to +25	0.7	0.7	0.7	0.6	0.1	1.0	0.9	1.9	2.1	2.4	1.5	2.0	1.8	1.8
+26 to +35	0.3	0.3	0.4	0.1	0.2	0.5	–	0.7	0.7	0.7	0.6	0.1	1.0	0.9
+36 and greater	0.0	0.2	–	–	–	–	–	0.3	0.5	0.4	0.1	0.2	0.5	–
Girls														
All levels	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
-25 or less	0.1	0.5	–	0.1	–	–	–	–	–	–	–	–	–	–
-24 to -15	9.2	10.0	10.4	8.5	9.1	7.8	9.0	0.1	0.5	–	0.1	–	–	–
-14 to -05	69.8	66.0	67.8	70.1	70.8	73.0	72.1	9.2	10.0	10.4	8.5	9.1	7.8	9.0
-04 to +05	18.2	19.7	18.7	18.7	17.8	17.2	17.1	69.8	66.0	67.8	70.1	70.8	73.0	72.1
+06 to +15	2.1	3.0	2.0	2.5	1.7	1.5	1.8	18.2	19.7	18.7	18.7	17.8	17.2	17.1
+16 to +25	0.4	0.8	0.7	0.1	0.3	0.2	–	2.1	3.0	2.0	2.5	1.7	1.5	1.8
+26 to +35	0.1	–	0.3	–	–	0.2	–	0.4	0.8	0.7	0.1	0.3	0.2	–
+36 and greater	0.1	–	0.1	–	0.3	0.1	–	0.2	–	0.4	–	0.3	0.3	–

Table 12. Percent distribution of youths by hearing levels in decibels re audiometric zero (ASA-1951 and ANSI-1969) for the better ear at 2000 Hertz, according to age and sex: United States, 1966-70

Sex and hearing levels in decibels	Total, 12-17 years	12 years	13 years	14 years	15 years	16 years	17 years	Total, 12-17 years	12 years	13 years	14 years	15 years	16 years	17 years
Both sexes	Percent distribution (ASA-1951)							Percent distribution (ANSI-1969)						
All levels	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
-25 or less	0.1	0.2	0.1	0.2	–	0.1	0.2	0.0	–	–	–	–	–	0.1
-24 to -15	12.2	12.4	13.7	10.5	12.4	11.7	12.3	0.2	0.2	0.1	0.3	0.1	0.1	0.2
-14 to -05	60.6	60.7	61.0	61.9	58.3	62.7	59.0	15.1	14.6	16.8	13.8	14.8	15.4	15.2
-04 to +05	23.3	23.4	20.5	23.2	25.7	21.7	25.3	62.0	63.1	61.0	63.5	59.6	62.9	61.9
+06 to +15	3.0	2.4	3.8	3.2	2.9	3.0	2.5	19.6	19.2	18.1	19.1	22.5	18.6	20.2
+16 to +25	0.4	0.5	0.2	0.4	0.4	0.4	0.6	2.3	1.9	3.1	2.6	2.3	2.3	1.8
+26 to +35	0.3	0.4	0.5	0.4	0.3	0.2	0.1	0.4	0.6	0.2	0.2	0.4	0.3	0.5
+36 and greater	0.1	0.0	0.2	0.2	–	0.2	–	0.4	0.4	0.7	0.5	0.3	0.4	0.1
Boys														
All levels	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
-25 or less	0.1	0.3	–	0.1	–	–	0.2	–	–	–	–	–	–	–
-24 to -15	11.3	8.8	14.0	9.5	13.6	12.2	9.8	0.1	0.2	–	0.1	0.1	–	0.2
-14 to -05	59.1	61.6	58.4	61.0	53.8	61.6	58.2	14.0	10.9	17.1	12.2	16.2	15.9	12.1
-04 to +05	24.3	24.6	21.2	24.2	27.6	21.1	27.3	60.7	63.9	57.8	63.5	55.4	61.0	62.5
+06 to +15	4.1	3.5	5.1	4.3	4.4	3.9	3.3	21.0	20.9	19.5	20.1	24.3	19.3	21.7
+16 to +25	0.6	0.7	0.3	0.4	0.2	0.6	1.2	3.2	2.9	4.3	3.3	3.4	2.9	2.5
+26 to +35	0.4	0.4	0.8	0.4	0.4	0.4	–	0.5	0.8	0.3	0.3	0.3	0.4	1.0
+36 and greater	0.1	0.1	0.2	0.1	--	0.2	–	0.5	0.4	1.0	0.5	0.3	0.5	–
Girls														
All levels	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
-25 or less	0.2	0.2	0.1	0.3	–	0.2	0.2	0.0	0.0	–	–	–	–	0.2
-24 to -15	13.1	16.1	13.4	11.7	11.2	11.1	14.7	0.2	0.2	0.1	0.4	–	0.3	0.2
-14 to -05	62.1	59.7	63.6	62.9	63.0	63.7	59.8	16.2	18.4	16.6	15.5	13.5	14.8	18.3
-04 to +05	22.2	22.1	19.7	22.2	23.6	22.4	23.3	63.4	62.2	64.3	63.4	63.9	64.9	61.4
+06 to +15	1.8	1.2	2.6	2.0	1.3	2.2	1.7	18.2	17.4	16.6	18.2	20.7	17.9	18.6
+16 to +25	0.3	0.3	0.2	0.3	0.6	0.3	–	1.4	1.0	1.8	1.8	1.2	1.7	1.0
+26 to +35	0.2	0.4	0.1	0.3	0.3	–	0.3	0.2	0.4	0.2	0.1	0.4	0.3	–
+36 and greater	0.1	–	0.3	0.3	–	0.1	–	0.4	0.4	0.4	0.6	0.3	0.1	0.3

Table 13. Percent distribution of youths by hearing levels in decibels re audiometric zero (ASA-1951 and ANSI-1969) for the better ear at 3000 Hertz, according to age and sex: United States, 1966-70

Sex and hearing levels in decibels	Total, 12-17 years	12 years	13 years	14 years	15 years	16 years	17 years	Total, 12-17 years	12 years	13 years	14 years	15 years	16 years	17 years
Both sexes	Percent distribution (ASA-1951)							Percent distribution (ANSI-1969)						
All levels	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
-25 or less	0.0	–	0.1	0.1	–	–	–	–	–	–	–	–	–	–
-25 to -15	3.1	3.6	3.2	3.9	2.2	3.0	2.3	0.0	–	0.1	0.1	–	–	–
-14 to -05	44.8	45.1	45.0	41.8	46.6	45.5	44.7	3.6	4.1	3.8	4.4	2.4	3.7	3.0
-04 to +05	42.8	41.7	41.4	45.7	40.7	42.3	45.0	49.5	49.2	48.8	48.2	51.8	49.5	49.5
+06 to +15	7.5	8.1	8.0	6.6	8.5	7.6	6.3	39.6	39.2	38.8	40.7	37.2	39.5	42.2
+16 to +25	1.0	1.0	1.3	1.0	1.0	0.4	1.1	5.8	6.3	6.5	5.1	6.8	5.9	4.2
+26 to +35	0.5	0.4	0.5	0.7	0.6	0.8	0.4	0.7	0.7	1.0	0.7	0.8	0.3	0.5
+36 and greater	0.3	0.1	0.5	0.2	0.4	0.4	0.2	0.8	0.5	1.0	0.8	1.0	1.1	0.6
Boys														
All levels	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
-25 or less	0.0	–	–	0.1	–	–	–	–	–	–	–	–	–	–
-24 to -15	2.0	2.7	1.5	2.3	2.0	2.5	0.9	0.0	–	–	0.2	–	–	–
-14 to -05	39.2	41.5	41.8	36.8	40.0	36.5	38.0	2.3	3.2	2.0	2.4	2.2	2.5	1.1
-04 to +05	47.3	44.1	43.7	50.3	44.3	49.8	52.2	43.8	44.3	44.6	43.1	44.8	41.8	44.4
+06 to +15	8.9	9.9	9.9	8.1	10.7	8.5	6.1	44.5	43.4	42.0	46.0	42.2	46.1	47.7
+16 to +25	1.3	1.2	1.7	1.3	1.7	0.6	1.8	7.2	7.5	8.7	6.5	8.3	7.1	5.0
+26 to +35	0.8	0.4	0.6	0.8	0.6	1.6	0.8	1.0	0.9	1.3	1.0	1.3	0.6	0.8
+36 and greater	0.5	0.2	0.8	0.3	0.7	0.5	0.2	1.2	0.7	1.4	0.8	1.2	1.9	1.0
Girls														
All levels	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
-25 or less	0.0	–	0.2	–	–	–	–	–	–	–	–	–	–	–
-25 to -15	4.1	4.6	5.0	5.5	2.3	3.5	3.7	0.0	–	0.2	–	–	–	–
-14 to -05	50.5	48.8	48.2	46.9	53.3	54.8	51.3	5.0	5.1	5.7	6.4	2.7	4.9	4.9
-04 to +05	38.2	39.3	39.0	41.0	37.1	34.7	37.8	55.3	54.2	53.1	53.4	59.0	57.5	54.7
+06 to +15	6.1	6.1	6.1	5.0	6.3	6.6	6.5	34.5	34.8	35.4	35.2	32.1	32.8	36.6
+16 to +25	0.6	0.9	0.9	0.8	0.3	0.3	0.4	4.4	5.0	4.2	3.7	5.2	4.7	3.4
+26 to +35	0.3	0.3	0.3	0.6	0.5	–	–	0.4	0.6	0.8	0.5	0.3	–	0.1
+36 and greater	0.2	–	0.3	0.2	0.2	0.1	0.3	0.4	0.3	0.6	0.8	0.7	0.1	0.3

Table 14. Percent distribution of youths by hearing levels in decibels re audiometric zero (ASA-1951 and ANSI-1969) for the better ear at 4000 Hertz, according to age and sex: United States, 1966-70

Sex and hearing levels in decibels	Total, 12-17 years	12 years	13 years	14 years	15 years	16 years	17 years	Total, 12-17 years	12 years	13 years	14 years	15 years	16 years	17 years
Both sexes	Percent distribution (ASA-1951)							Percent distribution (ANSI-1969)						
All levels	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
-25 or less	0.0	–	–	–	–	0.1	–	–	–	–	–	–	–	–
-24 to -15	0.8	1.0	0.8	0.5	0.5	1.0	1.2	0.0	–	0.1	–	–	0.1	–
-14 to -05	29.9	29.6	28.7	31.5	29.8	31.8	27.7	1.6	1.4	1.5	1.0	1.1	2.2	2.3
-04 to +05	54.7	55.0	56.2	53.6	55.8	51.1	56.7	34.8	34.7	33.2	35.9	37.0	35.4	32.4
+06 to +15	11.3	11.1	11.4	11.5	10.5	12.8	10.7	50.7	51.2	52.9	50.6	48.8	47.9	52.8
+16 to +25	1.8	2.5	1.3	1.7	1.9	1.4	1.8	9.9	9.5	9.5	10.0	9.9	11.3	9.0
+26 to +35	0.7	0.4	0.6	0.7	0.5	0.9	1.1	1.6	2.4	1.2	1.4	1.7	1.4	1.6
+36 and greater	0.8	0.4	1.0	0.5	1.0	0.9	0.8	1.4	0.8	1.6	1.1	1.5	1.7	1.9
Boys														
All levels	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
-25 or less	–	–	–	–	–	–	–	–	–	–	–	–	–	–
-24 to -15	0.6	0.8	0.5	0.5	0.3	1.0	0.1	–	–	–	–	–	–	–
-14 to -05	25.7	27.9	25.4	26.5	27.3	25.4	21.7	1.1	1.1	1.3	0.9	0.9	2.4	0.1
-04 to +05	55.8	54.4	56.8	56.9	54.4	53.1	59.5	30.7	32.3	29.2	31.6	34.5	29.4	26.9
+06 to +15	12.9	11.6	13.0	11.9	12.3	15.8	12.9	51.9	51.2	53.9	53.4	47.5	49.5	56.0
+16 to +25	2.6	3.7	2.5	2.4	3.0	1.4	2.4	11.5	10.3	11.3	10.3	11.8	14.2	11.5
+26 to +35	1.1	0.7	0.3	1.2	0.8	1.7	1.9	2.4	3.6	2.4	2.1	2.7	1.5	2.1
+36 and greater	1.3	0.9	1.5	0.6	1.9	1.6	1.5	2.4	1.5	1.9	1.7	2.6	3.0	3.4
Girls														
All levels	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
-25 or less	0.0	–	–	–	–	0.2	–	–	–	–	–	–	–	–
-24 to -15	1.1	1.1	1.2	0.5	0.7	1.0	2.3	0.1	–	0.2	–	–	0.2	–
-14 to -05	34.1	31.3	32.2	36.8	32.4	38.4	33.8	2.0	1.8	1.7	1.1	1.2	1.9	4.4
-04 to +05	53.6	55.6	55.6	50.2	57.2	49.1	53.9	39.0	37.2	37.3	40.3	39.7	41.6	38.1
+06 to +15	9.7	10.5	9.6	11.0	8.6	9.6	8.4	49.5	51.1	51.9	47.7	50.1	46.3	49.7
+16 to +25	1.0	1.3	0.1	1.0	0.8	1.3	1.2	8.1	8.6	7.6	9.7	8.0	8.4	6.4
+26 to +35	0.3	0.2	0.9	–	0.2	0.3	0.3	0.8	1.2	–	0.7	0.7	1.2	1.0
+36 and greater	0.2	–	0.4	0.5	0.1	0.1	0.1	0.5	0.1	1.3	0.5	0.3	0.4	0.4

Table 15. Percent distribution of youths by hearing levels in decibels re audiometric zero (ASA-1951 and ANSI-1969) for the better ear at 6000 Hertz, according to age and sex: United States, 1966-70

Sex and hearing levels in decibels	Total, 12-17 years	12 years	13 years	14 years	15 years	16 years	17 years	Total, 12-17 years	12 years	13 years	14 years	15 years	16 years	17 years
Both sexes	Percent distribution (ASA-1951)							Percent distribution (ANSI-1969)						
All levels	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
-25 or less	0.0	–	0.1	–	–	0.1	–	0.0	–	–	–	–	0.1	–
-24 to -15	1.0	1.3	0.8	1.2	0.8	0.8	0.9	0.0	–	0.1	–	–	–	–
-14 to -05	21.3	25.0	23.2	21.6	20.1	17.7	19.4	1.4	1.8	1.0	1.8	1.0	1.3	1.7
-04 to +05	47.5	48.8	47.1	46.0	47.5	48.3	47.6	24.1	27.5	27.1	24.6	22.9	21.0	20.8
+06 to +15	22.9	18.0	21.4	25.4	24.4	23.8	24.6	47.7	49.0	45.4	46.8	48.1	48.1	49.1
+16 to +25	4.7	4.6	4.6	3.4	4.7	5.7	5.1	20.1	15.2	20.0	21.2	21.1	21.4	21.8
+26 to +35	1.0	1.0	1.5	0.8	0.9	1.3	0.7	4.1	4.4	3.6	3.2	4.5	4.5	4.2
+36 and greater	1.6	1.3	1.3	1.6	1.6	2.3	1.7	2.6	2.1	2.8	2.4	2.4	3.6	2.4
Boys														
All levels	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
-25 or less	0.0	–	–	–	–	0.1	–	0.0	–	–	–	–	0.1	–
-24 to -15	0.5	0.8	0.7	0.4	0.6	0.4	–	–	–	–	–	–	–	–
-14 to -05	18.1	23.4	20.1	18.4	16.6	14.4	15.1	0.7	0.9	0.7	0.7	0.6	1.0	0.5
-04 to +05	45.9	47.5	47.2	45.6	47.6	44.8	42.1	21.1	26.3	23.8	21.8	20.0	17.3	16.5
+06 to +15	25.8	19.1	22.7	27.9	25.6	28.6	32.0	46.4	47.6	45.8	47.4	47.4	45.4	44.7
+16 to +25	5.8	5.8	5.6	4.4	6.2	6.0	6.8	22.8	16.1	21.4	22.8	23.0	25.9	28.5
+26 to +35	1.3	1.2	1.8	1.2	1.0	1.4	0.9	5.1	5.7	4.6	4.1	5.7	4.6	5.9
+36 and greater	2.6	2.2	1.9	2.1	2.4	4.3	3.1	3.9	3.4	3.7	3.2	3.3	5.7	3.9
Girls														
All levels	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
-25 or less	0.0	–	0.2	–	–	–	–	–	–	–	–	–	–	–
-24 to -15	1.5	1.8	0.9	2.1	1.2	1.1	1.8	0.0	–	0.2	–	–	–	–
-14 to -05	24.5	26.7	26.4	24.8	23.7	21.1	23.8	2.2	2.6	1.2	2.9	1.6	1.6	3.0
-04 to +05	49.3	50.1	47.0	46.5	47.4	51.8	53.2	27.2	28.8	30.6	27.5	25.8	24.8	25.2
+06 to +15	19.8	17.0	20.1	22.8	23.1	19.0	17.1	49.0	50.5	45.0	46.1	48.9	50.9	53.5
+16 to +25	3.5	3.3	3.6	2.3	3.2	5.5	3.3	17.3	14.2	18.6	19.7	19.1	16.9	15.0
+26 to +35	0.8	0.8	1.2	0.4	0.7	1.2	0.5	3.0	3.2	2.6	2.3	3.2	4.3	2.4
+36 and greater	0.6	0.3	0.6	1.1	0.7	0.3	0.3	1.3	0.7	1.8	1.5	1.4	1.5	0.9

Table 16. Percent distribution of youths by hearing levels in decibels re audiometric zero (ASA-1951 and ANSI-1969) for the better ear at 8000 Hertz, according to age and sex: United States, 1966-70

Sex and hearing levels in decibels	Total, 12-17 years	12 years	13 years	14 years	15 years	16 years	17 years	Total, 12-17 years	12 years	13 years	14 years	15 years	16 years	17 years
Both sexes	Percent distribution (ASA-1951)							Percent distribution (ANSI-1969)						
All levels	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
-25 or less	1.0	0.6	0.4	1.5	0.4	1.7	1.3	0.0	–	–	0.1	–	–	–
-24 to -15	18.1	16.2	17.1	17.6	19.3	19.5	19.1	0.2	0.1	0.1	0.3	0.1	0.6	0.1
-14 to -05	47.0	48.9	47.6	47.4	45.7	45.2	47.3	7.3	7.3	6.7	7.1	7.7	8.3	6.7
-04 to +05	26.3	26.0	27.1	26.3	26.2	26.9	25.4	38.8	37.1	37.2	37.9	40.1	40.2	40.8
+06 to +15	5.1	5.8	5.5	5.4	5.2	4.4	4.2	39.2	41.0	39.6	41.3	35.7	38.0	39.5
+16 to +25	1.2	1.3	1.2	0.6	1.4	1.1	1.7	10.6	10.6	12.4	9.3	12.5	9.4	9.1
+26 to +35	0.5	0.4	0.4	0.5	1.1	0.3	0.2	2.3	2.5	2.4	2.7	1.8	1.9	2.3
+36 and greater	0.8	0.8	0.7	0.7	0.7	0.9	0.8	1.6	1.4	1.6	1.3	2.1	1.6	1.5
Boys														
All levels	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
-25 or less	0.9	0.7	0.2	1.1	0.3	1.0	2.1	0.0	–	–	0.2	–	–	–
-24 to -15	17.1	17.7	15.9	16.8	19.4	16.4	16.2	0.1	0.1	–	0.3	–	0.3	0.2
-14 to -05	45.6	44.3	46.6	46.7	42.8	45.0	48.6	6.8	7.0	7.3	5.3	8.4	6.4	6.2
-04 to +05	27.1	26.5	27.4	28.0	27.0	29.6	23.8	37.5	35.7	35.0	37.9	36.7	39.6	40.4
+06 to +15	5.8	7.4	6.3	5.6	6.3	4.4	4.8	39.0	38.8	39.6	42.3	36.6	38.3	38.5
+16 to +25	1.8	1.8	2.0	0.6	2.0	1.5	2.9	11.2	13.2	12.9	9.5	12.6	10.3	8.5
+26 to +35	0.6	0.4	0.4	0.5	1.3	0.6	0.3	3.1	3.4	2.8	3.2	2.9	2.1	3.8
+36 and greater	1.1	1.2	1.2	0.7	0.9	1.5	1.3	2.3	1.8	2.4	1.3	2.8	3.0	2.4
Girls														
All levels	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
-25 or less	1.1	0.6	0.6	1.8	0.6	2.5	0.5	–	–	–	–	–	–	–
-24 to -15	19.1	14.7	18.2	18.4	19.3	22.7	22.1	0.3	–	0.3	0.4	0.3	0.9	–
-14 to -05	48.5	53.6	48.7	48.1	48.6	45.4	45.9	7.9	7.7	6.0	9.0	7.0	10.3	7.2
-04 to +05	25.5	25.6	26.7	24.5	25.4	24.0	27.0	40.2	38.6	39.4	37.9	43.6	40.8	41.2
+06 to +15	4.4	4.1	4.7	5.2	4.2	4.5	3.6	39.4	43.2	39.7	40.3	34.8	37.6	40.6
+16 to +25	0.6	0.8	0.5	0.7	0.7	0.6	0.6	9.9	8.0	11.9	9.0	12.3	8.4	9.6
+26 to +35	0.4	0.3	0.3	0.6	0.8	–	–	1.4	1.5	1.9	2.1	0.6	1.7	0.7
+36 and greater	0.4	0.3	0.3	0.7	0.4	0.3	0.3	0.9	1.0	0.8	1.3	1.4	0.3	0.7

Table 17. Median hearing levels in decibels re audiometric zero (ASA-1951 and ANSI-1969) for the right, left, and better ear of youths 12-17 years at each test frequency and estimates for speech, by age: United States, 1966-70

Ear and tonal frequency	Total, 12-17 years	12 years	13 years	14 years	15 years	16 years	17 years	Total, 12-17 years	12 years	13 years	14 years	15 years	16 years	17 years
	Hearing levels (ASA-1951)							Hearing levels (ANSI-1969)						
Right ear														
250 Hertz	-9.3	-9.1	-9.0	-9.4	-9.3	-9.5	-9.3	10.1	10.3	10.4	9.9	10.0	9.9	10.1
500 Hertz	-7.8	-7.6	-7.4	-7.6	-7.5	-8.2	-8.4	7.3	7.7	7.5	7.4	7.4	7.2	6.4
1000 Hertz	-7.9	-7.4	-7.8	-7.7	-8.0	-8.2	-8.2	2.1	2.6	2.2	2.3	2.0	1.8	1.8
2000 Hertz	-7.3	-7.4	-7.7	-7.2	-6.9	-7.5	-7.1	2.0	1.9	1.8	2.0	2.3	1.8	2.1
3000 Hertz	-2.3	-2.3	-2.3	-2.0	-2.4	-2.6	-2.3	6.8	6.9	6.9	6.8	6.7	6.6	6.8
4000 Hertz	0.0	0.0	0.2	0.0	0.0	0.0	0.0	9.3	9.3	9.6	9.1	9.2	9.2	9.3
6000 Hertz	3.1	2.2	2.7	3.1	3.5	4.1	3.3	12.3	11.5	12.0	12.3	12.7	13.4	12.5
8000 Hertz	-5.7	-5.7	-5.7	-5.3	-5.5	-6.0	-6.1	8.9	8.8	9.2	9.0	9.2	8.5	8.8
Speech[1]	-6.6	-6.4	-6.5	-6.5	-6.2	-7.0	-6.8	5.7	6.2	5.4	6.0	6.2	5.3	5.1
Left ear														
250 Hertz	-8.3	-8.5	-8.1	-8.6	-8.2	-8.2	-8.0	11.1	10.9	11.3	10.7	11.2	11.4	11.4
500 Hertz	-7.5	-7.2	-7.1	-7.3	-7.5	-8.0	-7.6	7.8	8.0	8.2	7.9	7.8	7.3	7.4
1000 Hertz	-7.4	-7.2	-7.2	-7.5	-7.5	-7.6	-7.5	2.6	2.8	2.8	2.5	2.5	2.4	2.5
2000 Hertz	-6.6	-6.7	-6.8	-6.7	-6.2	-6.8	-6.7	2.5	2.5	2.6	2.5	3.0	2.4	2.3
3000 Hertz	-1.6	-1.8	-1.4	-1.5	-1.5	-1.8	-1.8	7.6	7.4	7.8	7.6	7.7	7.5	7.4
4000 Hertz	1.3	1.1	1.3	1.2	1.4	1.2	1.5	10.6	10.5	10.8	10.5	10.6	10.7	10.8
6000 Hertz	4.7	3.4	4.6	4.4	5.2	5.4	5.4	13.6	12.4	13.8	13.1	14.2	14.4	14.4
8000 Hertz	-5.2	-4.3	-4.7	-5.6	-5.4	-5.8	-5.5	9.2	9.8	10.0	9.2	9.1	8.2	8.9
Speech[1]	-5.8	-5.6	-5.5	-5.7	-5.7	-6.1	-6.3	6.5	6.7	6.8	6.5	6.6	[illegible]	6.4
Better ear														
250 Hertz	-10.1	-10.1	-10.0	-10.3	-10.2	-10.2	-10.0	9.2	9.2	9.5	9.0	9.0	9.2	9.4
500 Hertz	-8.9	-8.6	-8.6	-8.8	-8.8	-9.2	-9.3	5.4	5.9	5.8	5.5	5.4	5.1	4.8
1000 Hertz	-9.0	-8.8	-8.9	-8.9	-9.1	-9.2	-9.2	1.0	1.2	1.1	1.1	0.9	0.8	0.8
2000 Hertz	-8.8	-8.8	-9.1	-8.7	-8.6	-8.9	-8.6	0.6	0.6	0.4	0.7	0.9	0.5	0.6
3000 Hertz	-4.5	-4.7	-4.6	-4.1	-4.7	-4.6	-4.3	4.4	4.3	4.5	4.4	4.2	4.4	4.5
4000 Hertz	-1.5	-1.5	-1.4	-1.6	-1.5	-1.6	-1.3	7.7	7.7	7.9	7.6	7.4	7.6	7.9
6000 Hertz	0.8	-0.1	0.5	0.9	1.1	1.5	1.2	10.1	9.2	9.8	10.1	10.4	10.7	10.6
8000 Hertz	-8.4	-8.2	-8.2	-8.5	-8.4	-8.6	-8.7	5.9	6.3	6.5	6.1	5.6	5.3	5.6
Speech[1]	-7.7	-7.6	-7.6	-7.6	-7.4	-8.0	-7.8	4.0	4.5	4.0	4.1	4.3	3.4	3.7

[1] Average of levels at 500, 1000, and 2000 Hertz.

Table 18. Median hearing levels in decibels re audiometric zero (ASA-1951 and ANSI-1969) for the right, left, and better ear of boys 12-17 years at each test frequency and estimates for speech, by age: United States, 1966-70

Ear and tonal frequency	Total, 12-17 years	12 years	13 years	14 years	15 years	16 years	17 years	Total, 12-17 years	12 years	13 years	14 years	15 years	16 years	17 years
	Hearing levels (ASA-1951)							Hearing levels (ANSI-1969)						
Right ear														
250 Hertz	-9.3	-9.5	-9.1	-9.4	-9.3	-9.3	-9.0	10.1	10.0	10.4	9.9	10.1	10.1	10.4
500 Hertz	-7.6	-7.7	-7.4	-7.3	-7.3	-7.9	-8.4	7.6	8.0	7.7	7.9	7.6	7.6	6.3
1000 Hertz	-7.8	-7.4	-7.7	-7.5	-7.9	-8.1	-8.1	2.2	2.6	2.3	2.5	2.1	1.9	1.9
2000 Hertz	-7.1	-7.1	-7.7	-7.0	-6.6	-7.6	-6.6	2.2	2.3	1.9	2.1	2.5	1.7	2.5
3000 Hertz	-1.4	-1.8	-1.3	-1.2	-1.6	-1.4	-1.3	7.8	7.6	8.0	7.9	7.8	7.8	7.9
4000 Hertz	0.6	0.2	0.7	0.5	0.5	0.7	1.0	9.9	9.6	10.2	9.6	9.8	10.0	10.4
6000 Hertz	4.6	2.7	3.8	4.4	4.7	6.6	6.1	13.6	11.9	13.0	13.4	14.0	15.5	14.8
8000 Hertz	-4.9	-4.8	-4.9	-4.6	-4.5	-5.1	-5.4	9.5	9.3	9.7	9.6	9.8	9.3	9.1
Speech[1]	-6.3	-6.2	-6.3	-6.1	-6.0	-6.9	-6.4	6.1	6.6	5.6	6.4	6.2	5.9	5.5
Left ear														
250 Hertz	-8.3	-8.7	-8.3	-8.6	-8.1	-8.3	-7.9	11.1	10.7	11.2	10.6	11.3	11.3	11.6
500 Hertz	-7.2	-6.7	-7.0	-6.9	-7.3	-7.8	-7.3	8.1	8.3	8.6	8.3	8.2	7.8	7.4
1000 Hertz	-7.1	-6.8	-6.8	-7.2	-7.1	-7.6	-7.0	2.9	3.2	3.2	2.8	2.9	2.4	3.0
2000 Hertz	-6.1	-6.1	-6.3	-6.0	-5.5	-6.5	-5.9	3.1	3.1	3.1	3.1	3.6	2.7	2.8
3000 Hertz	-0.5	-0.8	-0.4	-0.3	-0.3	-0.3	-0.6	8.9	8.5	9.0	9.0	9.0	9.1	8.6
4000 Hertz	2.3	1.9	2.0	1.9	2.3	2.5	3.1	11.6	11.3	11.4	11.3	11.5	11.9	12.2
6000 Hertz	6.3	4.7	5.7	5.7	6.6	6.9	8.4	15.0	13.7	14.9	13.9	15.6	15.7	17.2
8000 Hertz	-4.3	-3.3	-3.8	-4.7	-4.5	-4.5	-5.0	10.0	10.8	10.5	9.8	10.1	9.2	9.6
Speech[1]	-5.2	-5.1	-5.0	-4.8	-4.9	-5.8	-5.6	7.1	7.0	7.6	7.4	7.2	6.3	6.9
Better ear														
250 Hertz	-10.1	-10.4	-10.1	-10.3	-10.2	-10.1	-9.8	9.2	9.0	9.4	8.9	9.1	9.3	9.6
500 Hertz	-8.7	-8.5	-8.5	-8.6	-8.6	-9.2	-9.2	5.9	6.4	6.2	6.2	5.9	6.0	4.7
1000 Hertz	-8.9	-8.7	-8.6	-8.7	-9.0	-9.1	-9.1	1.1	1.3	1.4	1.3	1.0	0.9	0.9
2000 Hertz	-8.5	-3.3	-8.8	-8.4	-8.2	-8.9	-8.1	0.9	1.1	0.7	0.9	1.1	0.6	1.0
3000 Hertz	-3.1	-3.7	-3.5	-2.8	-3.2	-2.8	-2.9	5.9	5.6	5.8	5.9	5.7	6.3	5.9
4000 Hertz	-0.8	-1.1	-0.7	-0.9	-0.9	-0.6	-0.3	8.5	8.3	8.6	8.3	8.1	8.7	9.1
6000 Hertz	1.8	0.4	1.2	1.8	1.9	2.8	3.3	11.1	9.8	10.6	10.8	11.2	12.0	12.4
8000 Hertz	-8.0	-7.9	-7.7	-8.1	-7.9	-7.7	-8.5	6.4	6.9	6.9	6.5	6.4	6.0	5.8
Speech[1]	-7.4	-7.5	-7.3	-7.3	-7.1	-8.0	-7.4	4.4	4.8	4.6	4.5	4.5	3.7	4.1

[1] Average of levels at 500, 1000, and 2000 Hertz.

Table 19. Median hearing levels in decibels re audiometric zero (ASA-1951 and ANSI-1969) for the right, left, and better ear of girls 12-17 years at each test frequency and estimates for speech, by age: United States, 1966-70

Ear and tonal frequency	Total, 12-17 years	12 years	13 years	14 years	15 years	16 years	17 years	Total, 12-17 years	12 years	13 years	14 years	15 years	16 years	17 years
Right ear	Hearing levels (ASA-1951)							Hearing levels (ANSI-1969)						
250 Hertz	-9.3	-8.7	-8.9	-9.4	-9.3	-9.7	-9.7	10.1	10.6	10.5	10.0	10.0	9.8	9.7
500 Hertz	-7.9	-7.5	-7.5	-7.9	-7.6	-8.6	-8.4	7.0	7.4	7.3	6.8	7.3	6.7	6.6
1000 Hertz	-8.0	-7.5	-7.9	-7.9	-8.0	-8.3	-8.2	2.0	2.5	2.1	2.1	2.0	1.7	1.8
2000 Hertz	-7.5	-7.8	-7.7	-7.4	-7.1	-7.3	-7.6	1.8	1.5	1.7	1.8	2.1	1.9	1.7
3000 Hertz	-3.3	-2.8	-3.5	-2.9	-3.1	-3.8	-3.7	5.5	6.1	5.0	5.4	5.6	5.0	5.4
4000 Hertz	-0.6	-0.2	-0.4	-0.6	-0.6	-0.7	-1.0	8.7	9.0	8.8	8.6	8.7	8.5	8.2
6000 Hertz	1.9	1.8	1.6	2.0	2.4	2.2	1.4	11.2	11.1	11.1	11.3	11.5	11.7	10.7
8000 Hertz	-6.4	-6.4	-6.4	-5.9	-6.3	-6.9	-6.8	8.4	8.4	8.7	8.3	8.6	7.7	8.5
Speech[1]	-6.8	-6.7	-6.8	-6.8	-6.3	-7.1	-7.1	5.4	5.7	5.1	5.6	6.1	4.8	4.8
Left ear														
250 Hertz	-8.2	-8.2	-8.0	-8.5	-8.3	-8.1	-8.2	11.2	11.0	11.5	10.8	11.1	11.5	11.2
500 Hertz	-7.8	-7.6	-7.3	-7.5	-7.8	-8.3	-7.9	7.4	7.6	7.7	7.4	7.3	6.7	7.4
1000 Hertz	-7.7	-7.6	-7.6	-7.7	-7.9	-7.6	-7.9	2.3	2.4	2.4	2.3	2.1	2.4	2.1
2000 Hertz	-7.2	-7.3	-7.2	-7.4	-6.8	-7.0	-7.4	2.0	2.0	2.1	1.9	2.5	2.0	1.8
3000 Hertz	-2.9	-2.9	-2.5	-2.9	-2.9	-3.5	-3.1	6.1	6.2	6.5	6.0	6.2	5.7	6.0
4000 Hertz	0.4	0.4	0.8	0.5	0.5	-0.1	0.0	9.7	9.7	10.1	9.7	9.8	9.5	9.4
6000 Hertz	3.3	2.2	3.7	3.3	4.0	4.2	2.9	12.4	11.3	12.8	12.3	12.9	13.3	12.2
8000 Hertz	-6.0	-5.2	-5.6	-6.4	-6.1	-6.9	-6.1	8.5	8.9	9.5	8.6	8.0	7.2	8.1
Speech[1]	-6.4	-6.0	-6.0	-6.4	-6.5	-6.4	-6.8	5.9	6.4	5.9	5.4	6.0	5.8	5.8
Better ear														
250 Hertz	-10.1	-9.8	-9.9	-10.3	-10.3	-10.2	-10.1	9.2	9.6	9.5	9.0	8.9	9.1	9.2
500 Hertz	-9.0	-8.7	-8.7	-9.0	-9.0	-9.3	-9.3	4.9	5.5	5.3	4.8	4.8	4.2	5.0
1000 Hertz	-9.2	-9.0	-9.2	-9.2	-9.2	-9.2	-9.3	0.8	1.0	0.8	0.9	0.8	0.8	0.7
2000 Hertz	-9.1	-9.4	-9.3	-8.9	-8.8	-8.9	-8.1	0.3	0.1	0.2	0.4	0.7	0.4	0.1
3000 Hertz	-5.9	-5.7	-5.7	-5.5	-6.0	-6.5	-6.0	3.1	3.3	3.3	3.2	3.0	2.9	3.2
4000 Hertz	-2.2	-1.8	-2.0	-2.5	-2.0	-2.9	-2.4	6.8	7.2	7.1	6.8	6.8	6.4	6.5
6000 Hertz	-0.1	-0.7	-0.2	0.0	0.3	0.4	-0.4	9.2	8.7	9.0	9.3	9.6	9.6	9.1
8000 Hertz	-8.9	-8.5	-8.6	-8.8	-8.8	-9.5	-9.0	5.4	5.8	6.1	5.7	4.8	4.5	5.4
Speech[1]	-7.9	-7.8	-7.9	-7.8	-7.8	-8.1	-8.2	3.6	4.2	3.4	3.6	4.0	3.2	3.3

[1] Average of levels at 500, 1000, and 2000 Hertz.

Table 20. Medians and quartile points[1] in the distribution of hearing levels in decibels re audiometric zero (ANSI-1969) for the better ear at each test frequency and estimates for speech among white youths, by age and sex: United States, 1966-70

Age and sex	250 Hertz			500 Hertz			1000 Hertz		
	P_{25}	Median	P_{75}	P_{25}	Median	P_{75}	P_{25}	Median	P_{75}
	Decibels re audiometric zero (ANSI-1969)								
Both sexes									
12-17 years	5.3	9.3	13.3	0.2	5.5	10.9	-2.7	0.9	4.5
12 years	5.2	9.3	13.4	0.3	5.9	11.3	-2.6	1.1	4.8
13 years	5.7	9.6	13.6	0.4	6.0	11.1	-2.8	1.0	4.7
14 years	4.9	8.9	12.9	0.2	5.5	10.8	-2.5	1.0	4.6
15 years	5.0	9.1	13.3	0.3	5.7	10.9	-2.7	0.8	4.3
16 years	5.5	9.3	13.1	-0.1	5.3	10.6	-2.7	0.8	4.3
17 years	5.5	9.4	13.3	-0.2	4.8	10.5	-2.8	0.8	4.3
Boys									
12-17 years	5.5	9.4	13.3	0.6	6.2	11.2	-2.5	1.1	4.8
12 years	5.0	9.1	13.2	0.5	6.2	11.4	-2.4	1.3	5.0
13 years	6.0	9.7	13.5	0.8	6.6	11.4	-2.6	1.3	5.4
14 years	5.3	9.0	12.7	0.6	6.2	11.3	-2.3	1.2	4.8
15 years	5.3	9.4	13.5	0.9	6.4	11.3	-2.6	1.0	4.5
16 years	5.7	9.4	13.1	0.6	6.3	11.1	-2.7	0.9	4.5
17 years	5.9	9.8	13.6	0.0	5.1	10.6	-2.7	0.9	4.5
Girls									
12-17 years	5.1	9.2	13.3	-0.2	4.8	10.5	-2.8	0.7	4.3
12 years	5.4	9.5	13.6	0.1	5.5	11.3	-2.8	0.9	4.6
13 years	5.3	9.6	13.8	0.0	5.2	10.8	-2.9	0.7	4.3
14 years	4.2	8.9	13.2	-0.3	4.8	10.3	-2.7	0.8	4.4
15 years	4.2	8.9	13.1	-0.2	4.7	10.4	-2.9	0.6	4.0
16 years	5.2	9.2	13.1	-0.6	4.1	9.9	-2.7	0.7	4.1
17 years	5.1	9.1	13.1	-0.3	4.6	10.4	-2.8	0.6	4.1

See footnotes at end of table.

Table 20. Medians and quartile points[1] in the distribution of hearing levels in decibels re audiometric zero (ANSI-1969) for the better ear at each test frequency and estimates for speech among white youths, by age and sex: United States, 1966-70—Con.

Age and sex	2000 Hertz			3000 Hertz			4000 Hertz		
	P_{25}	Median	P_{75}	P_{25}	Median	P_{75}	P_{25}	Median	P_{75}
	Decibels re audiometric zero (ANSI-1969)								
Both sexes									
12-17 years	-3.5	0.5	4.4	-0.9	4.0	10.2	1.5	7.5	12.5
12 years	-3.5	0.4	4.4	-1.0	3.9	10.2	1.5	7.5	12.5
13 years	-3.7	0.3	4.2	-0.9	3.9	10.3	1.9	7.7	12.5
14 years	-3.3	0.6	4.4	-1.0	4.1	10.2	1.4	7.3	12.4
15 years	-3.4	0.8	4.9	-0.7	4.0	10.3	1.4	7.3	12.4
16 years	-3.6	0.3	4.3	-0.8	4.1	10.3	1.2	7.4	12.8
17 years	-3.7	0.4	4.5	-0.7	4.2	10.1	1.6	7.7	12.5
Boys									
12-17 years	-3.3	0.8	4.9	0.0	5.5	11.3	2.6	8.4	13.3
12 years	-2.9	1.0	4.9	-0.4	5.0	11.1	2.1	8.1	13.1
13 years	-3.7	0.5	4.8	0.1	5.5	11.5	3.0	8.6	13.2
14 years	-3.1	0.8	4.7	0.0	5.6	11.2	2.4	8.2	12.9
15 years	-3.4	1.0	6.0	0.0	5.6	11.6	2.0	8.0	13.2
16 years	-3.6	0.4	4.5	0.1	5.9	11.6	2.4	8.6	13.8
17 years	-3.1	1.0	5.4	0.2	5.7	11.1	4.2	9.1	13.7
Girls									
12-17 years	-3.7	0.1	4.0	-1.6	2.8	8.7	0.6	6.5	11.6
12 years	-4.2	-0.2	3.8	-1.5	2.9	9.0	1.0	6.9	11.8
13 years	-3.7	0.0	3.7	-1.7	2.6	8.6	0.9	6.8	11.6
14 years	-3.5	0.3	4.2	-1.8	2.8	8.8	0.6	6.4	11.7
15 years	-3.4	0.5	4.5	-1.3	2.8	8.5	0.9	6.6	11.6
16 years	-3.6	0.3	4.1	-1.6	2.7	8.6	0.3	6.0	11.6
17 years	-4.2	-0.2	3.9	-1.5	3.0	8.8	-0.1	5.9	11.1

See footnotes at end of table.

Table 20. Medians and quartile points[1] in the distribution of hearing levels in decibels re audiometric zero (ANSI-1969) for the better ear at each test frequency and estimates for speech among white youths, by age and sex: United States, 1966-70—Con.

Age and sex	6000 Hertz			8000 Hertz			Speech[2]		
	P_{25}	Median	P_{75}	P_{25}	Median	P_{75}	P_{25}	Median	P_{75}
	Decibels re audiometric zero (ANSI-1969)								
Both sexes									
12-17 years	5.0	10.3	16.2	-0.4	6.1	12.4	-0.6	3.9	9.6
12 years	3.5	9.3	14.4	-0.1	6.5	12.6	-0.4	4.3	10.1
13 years	4.3	10.1	16.3	-0.1	6.6	13.0	-0.6	3.8	9.7
14 years	4.5	10.2	16.3	-0.3	6.3	12.2	-0.6	3.9	9.7
15 years	5.4	10.5	16.4	-0.7	5.6	12.6	-0.4	4.3	9.9
16 years	5.7	11.0	17.7	-0.9	5.5	12.0	-0.8	3.4	9.2
17 years	5.6	10.7	17.0	-0.4	5.9	12.1	-0.8	3.5	9.2
Boys									
12-17 years	5.9	11.4	18.6	0.0	6.7	13.0	-0.4	4.4	10.1
12 years	4.4	10.0	16.2	0.2	7.2	13.6	-0.2	4.7	10.4
13 years	5.7	11.0	17.9	0.3	7.4	13.5	-0.2	4.6	10.4
14 years	5.7	11.1	17.9	0.3	6.8	12.6	-0.4	4.3	9.9
15 years	6.0	11.3	18.3	-0.3	6.3	13.1	-0.2	4.7	10.3
16 years	6.7	12.3	19.9	-0.2	6.4	12.8	-0.6	3.9	9.7
17 years	6.9	12.8	20.3	-0.3	6.1	12.5	-0.5	4.1	9.8
Girls									
12-17 years	3.5	9.2	14.3	-0.8	5.4	11.8	-0.8	3.4	9.1
12 years	2.8	8.6	13.4	-0.4	5.9	11.7	-0.6	3.9	9.6
13 years	2.8	9.1	14.7	-0.5	5.8	12.4	-1.0	3.1	8.7
14 years	2.9	9.2	14.6	-0.9	5.6	11.8	-0.7	3.6	9.3
15 years	4.5	9.7	14.6	-1.0	4.9	12.1	-0.6	3.9	9.5
16 years	4.7	9.8	14.8	-1.7	4.6	11.1	-1.0	3.0	8.6
17 years	3.9	9.1	13.6	-0.5	5.7	11.7	-1.1	3.0	8.6

[1] P_{25}, median, and P_{75} are the points in the distribution of hearing levels below which 25, 50, and 75 percent of the children, respectively fall.

[2] Average of hearing levels at 500, 1000, and 2000 Hertz.

Table 21. Medians and quartile points[1] in the distribution of hearing levels in decibels re audiometric zero (ANSI-1969) for the better ear at each test frequency and estimates for speech among Negro youths, by age and sex: United States, 1966-70

Age and sex	250 Hertz			500 Hertz			1000 Hertz		
	P_{25}	Median	P_{75}	P_{25}	Median	P_{75}	P_{25}	Median	P_{75}
	Decibels re audiometric zero (ANSI-1969)								
Both sexes									
12-17 years	3.1	8.6	13.2	0.2	4.8	10.8	-2.4	1.5	5.8
12 years	5.0	9.0	13.1	0.7	6.5	11.5	-2.6	1.5	6.6
13 years	1.6	7.8	13.1	-0.4	4.4	10.7	-2.2	1.9	7.3
14 years	4.5	9.0	13.2	-0.1	5.3	11.2	-2.4	1.5	6.1
15 years	1.7	7.9	13.0	-0.8	3.6	10.3	-2.3	1.7	6.9
16 years	3.2	8.9	13.8	-0.3	4.5	10.6	-2.3	1.1	4.5
17 years	3.8	8.8	13.2	-0.3	4.5	10.2	-2.4	1.0	4.4
Boys									
12-17 years	2.2	8.0	12.6	-0.6	4.1	10.2	-2.4	1.3	5.0
12 years	4.3	8.6	12.4	1.4	7.1	11.8	-2.5	1.3	5.0
13 years	0.2	6.5	12.2	-0.8	3.5	9.5	-2.3	1.7	6.8
14 years	4.3	8.7	12.7	0.1	5.7	11.3	-2.2	1.7	6.4
15 years	0.6	7.0	12.1	-1.4	2.4	8.3	-2.7	1.4	6.0
16 years	3.5	9.0	13.9	-0.6	4.1	10.0	-2.3	1.0	4.3
17 years	2.0	7.8	12.5	-1.4	2.4	7.7	-2.4	0.9	4.2
Girls									
12-17 years	4.2	9.2	13.8	0.2	5.6	11.4	-2.3	1.6	6.4
12 years	5.3	9.6	13.9	0.1	5.7	11.2	-2.7	1.9	7.8
13 years	3.4	9.0	13.9	0.1	5.4	11.7	-2.1	2.1	7.8
14 years	4.7	9.4	13.8	-0.3	5.0	11.0	-2.5	1.4	5.7
15 years	3.1	8.9	13.9	0.1	5.2	11.7	-2.0	2.1	7.9
16 years	3.0	8.7	13.7	-0.1	4.8	11.1	-2.3	1.2	4.7
17 years	5.5	9.6	13.8	1.5	7.0	11.5	-2.4	1.1	4.6

See footnotes at end of table.

Table 21. Medians and quartile points[1] in the distribution of hearing levels in decibels re audiometric zero (ANSI-1969) for the better ear at each test frequency and estimates for speech among Negro youths, by age and sex: United States, 1966-70—Con.

Age and sex	2000 Hertz			3000 Hertz			4000 Hertz		
	P_{25}	Median	P_{75}	P_{25}	Median	P_{75}	P_{25}	Median	P_{75}
Both sexes	Decibels re audiometric zero (ANSI-1969)								
12-17 years	-2.8	1.6	6.9	1.0	6.9	12.1	3.8	8.9	13.4
12 years	-2.6	1.5	6.3	1.5	7.4	12.3	4.1	9.0	13.4
13 years	-3.5	1.8	8.0	1.7	7.8	12.6	3.4	8.8	13.5
14 years	-3.1	1.4	6.9	0.9	6.8	12.1	3.9	9.0	13.5
15 years	-2.4	1.9	7.6	0.2	6.0	12.2	2.1	8.3	13.5
16 years	-2.7	1.5	6.7	0.7	6.5	11.4	4.0	8.8	13.0
17 years	-2.4	1.4	5.4	0.9	6.6	11.6	5.3	9.3	13.4
Boys									
12-17 years	-2.6	1.6	6.9	1.9	7.7	12.3	4.3	9.0	13.4
12 years	-2.7	1.3	5.5	3.1	8.3	12.6	4.7	9.0	13.2
13 years	-3.5	1.8	8.0	0.8	7.4	12.8	3.6	8.9	13.5
14 years	-2.2	1.9	7.5	1.7	7.5	12.3	4.5	9.0	13.3
15 years	-3.2	1.7	7.7	0.6	6.4	11.8	2.2	8.6	14.2
16 years	-2.4	2.0	7.6	3.5	8.4	12.4	5.4	9.4	13.4
17 years	-2.2	1.2	4.6	2.4	7.6	11.7	5.2	9.1	13.1
Girls									
12-17 years	-2.9	1.5	6.9	0.2	6.0	11.8	3.3	8.7	13.3
12 years	-2.5	1.7	7.0	0.2	6.2	12.0	3.6	8.9	13.6
13 years	-3.5	1.8	8.0	2.6	8.1	12.5	3.3	8.7	13.4
14 years	-4.1	0.8	6.3	0.3	6.0	11.9	3.4	9.0	13.8
15 years	-1.8	2.1	7.4	-0.1	5.6	12.7	1.9	7.9	12.8
16 years	-2.9	1.1	5.5	-0.8	4.0	10.0	2.4	8.1	12.5
17 years	-2.6	1.6	6.7	-0.1	5.2	11.4	5.4	9.5	13.6

See footnotes at end of table.

Table 21. Medians and quartile points[1] in the distribution of hearing levels in decibels re audiometric zero (ANSI-1969) for the better ear at each test frequency and estimates for speech among Negro youths, by age and sex: United States, 1966-70—Con.

Age and sex	6000 Hertz			8000 Hertz			Speech[2]		
	P_{25}	Median	P_{75}	P_{25}	Median	P_{75}	P_{25}	Median	P_{75}
	Decibels re audiometric zero (ANSI-1969)								
Both sexes									
12–17 years	3.4	9.2	14.3	-0.7	5.0	11.6	-0.1	4.8	10.5
12 years	3.0	9.0	14.0	-0.7	5.3	11.4	0.3	5.8	10.8
13 years	1.5	7.8	13.6	0.0	6.1	11.9	0.0	5.1	10.8
14 years	4.1	9.4	14.2	-0.7	5.2	11.7	0.0	5.0	10.7
15 years	3.6	9.9	16.3	-0.7	5.7	12.5	-0.4	4.3	10.2
16 years	3.8	9.2	14.0	-1.2	3.7	10.5	-0.6	3.9	10.0
17 years	5.2	10.0	14.7	-1.1	4.3	11.2	0.0	4.9	10.3
Boys									
12–17 years	4.0	9.3	14.2	-0.9	4.6	11.5	-0.4	4.3	10.1
12 years	2.7	8.4	12.9	-0.4	5.1	11.5	0.0	5.2	10.6
13 years	1.1	7.3	13.7	-1.0	4.3	11.6	-0.6	4.0	9.8
14 years	4.4	9.2	13.0	-0.8	4.6	11.2	0.8	6.5	11.6
15 years	5.5	10.6	16.4	-1.1	6.7	13.4	-0.8	3.7	9.3
16 years	5.0	10.1	15.3	-1.5	3.3	9.9	-1.0	3.1	9.3
17 years	6.3	10.5	14.7	-1.0	4.5	11.3	-0.7	3.6	9.3
Girls									
12–17 years	2.8	9.0	14.4	-0.5	5.5	11.6	0.2	5.4	10.8
12 years	3.3	9.8	15.9	-1.1	5.5	11.3	0.8	6.3	11.0
13 years	2.1	8.3	13.6	1.4	7.4	12.2	0.7	6.3	11.6
14 years	3.8	9.6	14.8	-0.7	5.8	12.1	-0.7	3.8	9.6
15 years	1.9	8.9	16.1	-0.4	4.7	11.5	0.0	5.1	11.0
16 years	3.0	8.5	13.0	-1.0	4.2	11.0	-0.1	4.8	10.4
17 years	3.1	9.3	14.7	-1.2	4.2	11.0	0.8	6.3	11.0

[1] P_{25}, median, and P_{75} are the points in the distribution of hearing levels below which 25, 50, and 75 percent of the children, respectively fall.

[2] Average of hearing levels at 500, 1000, and 2000 Hertz.

Table 22. Mean hearing levels re audiometric zero (ANSI-1969) at each test frequency and estimates for speech in the better ear among youths by region, age, and sex: United States, 1966-70

Age and sex	250 Hertz				500 Hertz				1000 Hertz			
	Northeast	Midwest	South	West	Northeast	Midwest	South	West	Northeast	Midwest	South	West
Both sexes	Decibels re audiometric zero (ANSI-1969)											
12-17 years	8.0	10.0	8.8	9.4	5.7	5.6	6.9	5.6	1.6	1.0	2.1	1.8
12 years	7.8	9.6	10.6	9.2	5.8	5.7	8.2	6.1	1.6	1.4	2.8	2.0
13 years	7.6	11.2	9.1	9.4	5.2	6.6	7.9	5.0	1.4	1.8	2.6	1.2
14 years	7.8	9.2	8.2	9.6	5.9	5.4	6.4	5.8	2.0	0.6	2.0	2.0
15 years	8.4	10.1	7.8	9.3	6.4	5.7	6.4	5.4	1.8	1.2	1.8	1.2
16 years	8.0	9.6	8.6	9.6	5.4	5.1	6.0	5.6	1.4	0.8	1.6	2.0
17 years	8.2	10.4	8.9	9.7	5.5	4.8	6.4	5.2	1.0	0.4	1.8	2.0
Boys												
12-17 years	8.0	10.0	8.6	9.4	6.2	5.8	6.8	5.8	2.1	1.3	2.0	2.1
12 years	8.0	9.3	10.2	8.8	6.9	5.8	7.8	6.0	2.6	2.2	2.4	1.9
13 years	7.4	11.2	8.5	9.4	5.7	6.6	7.5	5.4	2.1	2.0	2.4	1.8
14 years	8.0	9.2	8.0	9.6	6.2	5.9	6.6	6.4	2.4	0.8	2.1	2.2
15 years	9.0	9.9	7.2	9.4	7.0	5.9	6.0	6.0	2.1	0.9	1.7	2.2
16 years	8.2	9.5	9.2	9.6	5.8	5.4	6.4	5.6	1.6	1.0	2.0	2.1
17 years	8.0	11.0	8.8	10.1	5.6	5.2	6.3	5.2	1.5	0.8	1.6	2.6
Girls												
12-17 years	7.9	10.0	9.1	9.4	5.2	5.3	7.0	5.3	1.0	0.8	2.2	1.4
12 years	7.7	9.8	10.9	9.6	4.6	5.6	8.6	6.3	0.6	0.8	3.2	2.2
13 years	8.0	11.2	9.8	9.4	4.8	6.5	8.3	4.8	0.6	1.6	2.6	0.7
14 years	7.6	9.2	8.5	9.6	5.4	4.9	6.2	5.2	1.4	0.2	1.9	1.8
15 years	7.8	10.4	8.6	9.2	5.7	5.5	6.6	5.0	1.4	1.6	2.0	0.2
16 years	7.9	9.8	7.8	9.8	5.2	4.8	5.6	5.4	1.2	0.7	1.2	2.0
17 years	8.4	10.0	9.0	9.2	5.4	4.6	6.6	5.1	0.6	0.1	2.0	1.2

Table 22. Mean hearing levels re audiometric zero (ANSI-1969) at each test frequency and estimates for speech in the better ear among youths by region, age, and sex: United States, 1966-70—Con.

Age and sex	2000 Hertz				3000 Hertz				4000 Hertz			
	Northeast	Midwest	South	West	Northeast	Midwest	South	West	Northeast	Midwest	South	West
Both sexes	Decibels re audiometric zero (ANSI-1969)											
12-17 years	0.9	0.8	1.4	1.2	5.2	4.4	7.2	4.6	6.4	7.9	8.9	8.6
12 years	1.2	0.4	1.8	1.0	5.2	4.0	7.3	5.0	6.5	7.6	9.2	8.6
13 years	0.2	1.2	2.4	0.6	5.2	5.0	8.1	4.2	6.8	8.9	9.3	8.2
14 years	0.8	0.6	1.6	1.5	5.4	4.6	7.1	4.0	6.1	7.8	8.5	8.2
15 years	1.6	1.2	1.4	0.8	5.4	4.8	7.4	4.6	5.6	8.0	9.3	8.6
16 years	0.2	0.9	1.0	1.8	5.0	4.0	7.2	5.0	6.8	7.2	8.8	8.9
17 years	1.2	0.8	0.5	1.4	4.8	4.3	6.2	5.2	6.9	7.6	8.4	9.3
Boys												
12-17 years	1.4	1.3	1.8	1.6	6.3	5.6	8.4	6.0	7.2	8.8	10.4	10.3
12 years	2.2	1.2	2.6	1.4	6.3	5.4	8.1	5.8	7.6	8.2	10.2	9.8
13 years	1.0	1.6	2.8	1.2	6.2	5.8	9.4	5.9	7.3	8.9	11.0	10.4
14 years	1.4	1.2	1.1	2.0	6.6	5.6	7.4	6.0	7.0	8.6	8.4	10.0
15 years	2.6	1.2	1.2	1.6	6.8	5.6	8.6	6.0	5.6	8.8	11.6	10.2
16 years	0.1	1.1	1.2	2.0	6.7	5.2	9.0	6.2	8.2	8.2	10.0	10.4
17 years	1.2	1.6	1.8	1.5	4.9	5.9	7.6	6.1	7.2	10.0	10.8	11.0
Girls												
12-17 years	0.3	0.4	1.2	0.8	4.0	3.3	6.0	3.2	5.6	7.0	7.4	6.9
12 years	0.4	-0.3	1.2	0.5	4.0	2.6	6.4	4.2	5.4	7.0	8.2	7.3
13 years	-0.7	0.9	2.0	0.0	4.0	4.2	6.8	2.4	6.2	9.0	7.6	6.0
14 years	0.1	-0.1	2.1	1.0	4.0	3.6	6.8	1.9	5.1	7.1	8.6	6.4
15 years	0.7	1.4	1.4	0.2	4.1	3.8	6.4	3.2	5.4	7.2	7.0	7.0
16 years	0.3	0.8	0.8	1.7	3.4	2.8	5.2	3.9	5.4	6.2	7.2	7.6
17 years	1.2	0.0	-1.0	1.2	4.8	2.9	4.6	4.0	6.6	5.4	5.8	7.2

Table 22. Mean hearing levels re audiometric zero (ANSI-1969) at each test frequency and estimates for speech in the better ear among youths by region, age, and sex: United States, 1966-70—Con.

Age and sex	6000 Hertz				8000 Hertz				Speech[1]			
	Northeast	Midwest	South	West	Northeast	Midwest	South	West	Northeast	Midwest	South	West
Both sexes	Decibels re audiometric zero (ANSI-1969)											
12-17 years	8.8	11.2	12.4	12.1	5.6	7.1	8.7	5.5	4.9	4.7	5.7	5.0
12 years	8.2	9.8	11.6	11.6	6.1	7.0	9.0	6.2	5.2	4.6	6.6	5.4
13 years	8.5	11.0	12.4	11.8	6.2	7.5	9.6	5.6	4.4	5.4	6.4	4.5
14 years	8.4	10.8	12.0	12.3	5.4	7.0	8.0	5.5	5.2	4.4	5.6	5.4
15 years	8.6	12.0	12.7	11.6	5.2	7.8	8.9	5.2	5.3	5.0	5.4	4.8
16 years	9.6	11.8	13.4	13.6	5.0	6.2	8.3	5.4	4.4	4.4	5.0	5.2
17 years	9.8	11.7	12.2	11.8	5.0	7.1	8.4	4.9	5.0	4.2	5.2	5.0
Boys												
12-17 years	10.1	12.5	14.2	13.5	6.4	7.6	9.6	6.3	5.4	4.9	5.8	5.4
12 years	9.3	11.0	12.5	12.6	7.8	7.2	10.2	6.3	6.2	5.0	6.8	5.4
13 years	9.4	11.8	14.1	13.2	6.7	7.2	11.4	6.9	5.0	5.6	6.3	4.8
14 years	9.4	12.2	12.7	13.8	6.0	7.6	8.1	5.6	5.7	4.9	5.4	5.7
15 years	9.8	12.4	14.6	13.2	6.2	7.9	9.5	6.8	6.0	4.8	5.2	5.5
16 years	11.3	13.8	15.4	14.7	6.1	7.6	9.0	6.6	4.4	4.6	5.5	5.4
17 years	11.6	14.2	15.9	13.6	5.5	7.8	9.8	5.6	5.2	4.6	5.6	5.2
Girls												
12-17 years	7.4	9.8	10.5	10.6	4.6	6.6	7.7	4.6	4.4	4.4	5.6	4.7
12 years	6.6	8.6	10.8	10.4	4.4	6.8	7.8	6.2	4.2	4.2	6.4	5.2
13 years	7.6	10.2	10.6	10.4	5.6	7.8	7.7	4.4	3.7	5.2	6.6	4.2
14 years	7.3	9.3	11.3	10.7	4.6	6.4	8.0	5.4	4.4	4.0	5.7	5.0
15 years	7.4	11.6	10.8	10.0	4.4	7.6	8.3	3.6	4.6	5.2	5.6	4.0
16 years	7.9	9.6	10.8	12.6	4.0	4.7	7.4	4.2	4.4	4.2	4.4	5.0
17 years	8.2	9.5	8.4	9.4	4.4	6.6	7.1	4.2	4.8	3.8	4.6	4.8

[1] Average hearing levels at 500, 1000, and 2000 Hertz.

Table 23. Medians and quartile points[1] in the distribution of hearing levels in decibels re audiometric zero (ANSI-1969) for the better ear at each test frequency and estimates for speech among youths in the Northeast, by age and sex: United States, 1966-70

Age and sex	250 Hertz			500 Hertz			1000 Hertz		
	P_{25}	Median	P_{75}	P_{25}	Median	P_{75}	P_{25}	Median	P_{75}
Both sexes	Decibels re audiometric zero (ANSI-1969)								
12–17 years	2.9	8.2	12.5	0.0	5.3	10.7	-2.6	1.0	4.5
12 years	2.2	7.9	12.4	-0.1	5.3	10.8	-2.7	1.0	4.6
13 years	3.4	8.2	12.2	-0.4	4.4	10.0	-2.6	0.9	4.4
14 years	2.5	7.9	12.3	0.2	5.4	10.9	-2.1	1.4	4.8
15 years	2.5	8.1	12.7	0.7	6.3	11.2	-2.8	1.0	4.7
16 years	3.6	8.4	12.4	0.0	5.3	10.6	-2.6	0.9	4.4
17 years	3.4	8.6	13.0	-0.1	5.0	10.5	-2.9	0.6	4.0
Boys									
12–17 years	3.4	8.3	12.4	0.7	6.3	11.1	-2.4	1.4	5.4
12 years	2.8	8.1	12.2	0.8	6.6	11.7	-2.3	1.5	6.0
13 years	3.0	8.0	12.0	0.3	5.8	10.6	-2.4	1.5	6.0
14 years	2.8	7.9	11.9	0.8	6.4	11.2	-1.8	2.0	6.8
15 years	5.1	9.2	13.2	1.1	6.7	11.4	-2.7	1.1	4.9
16 years	4.4	8.7	12.6	0.8	6.7	11.0	-2.6	1.0	4.6
17 years	3.2	8.4	12.7	0.1	5.3	10.5	-3.0	0.8	4.6
Girls									
12–17 years	2.4	8.0	12.5	-0.5	4.2	10.1	-2.8	0.6	3.9
12 years	1.6	7.6	12.5	-0.8	4.0	9.8	-3.1	0.4	3.9
13 years	4.0	8.5	12.4	-1.0	3.2	9.0	-2.8	0.4	3.6
14 years	2.2	7.9	12.7	-0.5	4.3	10.4	-2.4	0.8	3.9
15 years	0.9	6.8	12.1	0.3	5.8	11.0	-2.9	0.8	4.5
16 years	2.9	8.1	12.2	-0.6	3.9	10.0	-2.6	0.8	4.2
17 years	3.6	8.8	13.3	-0.3	4.8	10.4	-2.8	0.4	3.5

See footnotes at end of table.

Table 23. Medians and quartile points[1] in the distribution of hearing levels in decibels re audiometric zero (ANSI-1969) for the better ear at each test frequency and estimates for speech among youths in the Northeast, by age and sex: United States, 1966-70—Con.

Age and sex	2000 Hertz			3000 Hertz			4000 Hertz		
	P_{25}	Median	P_{75}	P_{25}	Median	P_{75}	P_{25}	Median	P_{75}
Both sexes	Decibels re audiometric zero (ANSI-1969)								
12-17 years	-3.2	0.6	4.5	-0.5	4.5	10.5	0.5	6.3	11.5
12 years	-3.0	0.8	4.6	-0.3	4.9	10.6	0.0	5.6	11.4
13 years	-3.6	0.1	3.9	-0.5	4.8	10.7	0.9	6.9	11.8
14 years	-3.4	0.5	4.3	-0.7	4.4	10.6	0.5	6.1	11.3
15 years	-2.8	1.4	6.1	-0.2	4.7	10.6	0.2	5.6	10.8
16 years	-3.5	0.2	3.9	-0.8	3.9	10.2	0.6	6.5	11.6
17 years	-3.0	0.9	4.9	-0.8	4.4	10.2	1.2	7.1	12.0
Boys									
12-17 years	-2.9	1.0	5.0	0.3	5.9	11.3	1.2	7.0	12.0
12 years	-2.3	1.5	5.8	0.3	6.2	11.4	0.4	6.4	12.3
13 years	-3.4	0.6	4.6	0.2	5.8	11.3	1.7	7.6	12.3
14 years	-2.8	0.9	4.6	0.1	5.5	11.3	1.6	7.3	11.9
15 years	-2.5	2.2	8.3	1.2	6.9	11.8	0.2	5.4	10.7
16 years	-3.5	0.1	3.7	0.8	6.6	11.7	1.7	7.6	12.3
17 years	-3.0	1.1	5.6	-0.9	4.3	10.2	2.0	7.7	12.3
Girls									
12-17 years	-3.6	0.2	4.0	-1.8	3.4	9.4	0.0	5.5	10.9
12 years	-3.7	0.1	3.9	-0.9	3.8	9.6	-0.3	4.9	10.5
13 years	-3.8	-0.3	3.2	-1.1	3.9	9.9	0.3	6.1	11.3
14 years	-4.1	-0.1	3.9	-1.7	3.3	9.5	-0.4	4.4	10.5
15 years	-3.0	0.7	4.4	-1.1	3.0	8.9	0.3	5.8	10.8
16 years	-3.6	0.2	4.0	-1.8	2.1	7.5	-0.1	5.2	10.8
17 years	-3.0	0.7	4.5	-0.7	4.5	10.1	0.5	6.5	11.7

See footnotes at end of table.

Table 23. Medians and quartile points[1] in the distribution of hearing levels in decibels re audiometric zero (ANSI-1969) for the better ear at each test frequency and estimates for speech among youths in the Northeast, by age and sex: United States, 1966-70—Con.

Age and sex	6000 Hertz			8000 Hertz			Speech[2]		
	P_{25}	Median	P_{75}	P_{25}	Median	P_{75}	P_{25}	Median	P_{75}
Both sexes	Decibels re audiometric zero (ANSI-1969)								
12–17 years	1.9	8.2	13.6	-1.2	4.6	11.1	-0.5	4.1	9.8
12 years	0.6	6.8	12.7	-1.2	4.5	11.5	-0.1	4.8	10.2
13 years	1.0	7.4	13.6	-0.9	5.6	12.0	-0.8	3.5	9.1
14 years	2.2	8.3	13.3	-0.7	5.3	11.0	-0.4	4.3	9.9
15 years	2.7	8.7	13.7	-1.4	4.0	10.8	-0.2	4.7	10.3
16 years	2.2	8.7	14.2	-1.8	3.4	10.5	-0.9	3.4	9.0
17 years	4.6	9.4	13.9	-0.8	4.8	10.7	-0.4	4.3	9.8
Boys									
12–17 years	3.2	9.2	14.5	-0.7	5.3	11.7	0.0	5.2	10.4
12 years	1.5	7.9	13.5	-0.5	6.1	13.3	0.5	6.0	10.9
13 years	1.6	8.1	14.4	-1.0	5.2	11.9	-0.1	4.8	10.2
14 years	3.1	8.8	13.8	0.2	6.5	11.6	0.1	5.3	10.5
15 years	4.7	9.8	14.7	-1.0	4.8	11.4	0.5	6.0	11.0
16 years	4.8	10.2	16.8	-1.1	3.9	11.1	-0.6	4.2	9.6
17 years	5.9	10.7	16.0	-0.6	4.6	10.6	-0.2	4.8	10.1
Girls									
12–17 years	0.9	7.2	12.6	-1.6	4.0	10.5	-0.9	3.3	8.9
12 years	-0.1	5.6	11.9	-1.8	3.3	9.7	-0.6	3.8	9.4
13 years	0.5	6.6	12.8	-0.7	6.0	12.1	-1.3	2.4	7.5
14 years	1.2	7.6	12.7	-1.6	3.8	10.2	-0.8	3.4	9.0
15 years	1.4	7.5	12.7	-1.9	3.2	10.2	-0.8	3.5	9.3
16 years	0.7	7.3	12.8	-2.6	2.9	10.0	-1.1	2.9	8.2
17 years	2.8	8.2	12.6	-1.1	5.1	10.8	-0.7	3.8	9.4

[1] P_{25}, median, and P_{75} are the points in the distribution of hearing levels below which 25, 50, and 75 percent of the children, respectively fall.

[2] Average of hearing levels at 500, 1000, and 2000 Hertz.

Table 24. Medians and quartile points[1] in the distribution of hearing levels in decibels re audiometric zero (ANSI-1969) for the better ear at each test frequency and estimates for speech among youths in the Midwest, by age and sex: United States, 1966-70

Age and sex	250 Hertz			500 Hertz			1000 Hertz		
	P_{25}	Median	P_{75}	P_{25}	Median	P_{75}	P_{25}	Median	P_{75}
	Decibels re audiometric zero (ANSI-1969)								
Both sexes									
12-17 years	6.1	9.9	13.8	-0.1	4.9	10.0	-2.9	0.6	4.2
12 years	5.6	9.6	13.7	0.0	5.2	10.8	-3.1	0.7	4.4
13 years	6.9	10.7	14.6	0.6	6.3	11.4	-2.9	1.1	5.2
14 years	5.5	9.4	13.3	-0.2	4.7	10.4	-3.0	0.4	3.8
15 years	6.0	10.0	14.0	0.0	5.2	10.5	-2.9	0.7	4.4
16 years	6.0	9.7	13.3	-0.6	4.0	9.8	-2.8	0.5	3.9
17 years	6.4	10.2	14.1	-0.5	4.1	9.9	-3.0	0.5	3.9
Boys									
12-17 years	6.2	10.0	13.8	0.1	5.4	10.8	-2.8	0.8	4.3
12 years	5.5	9.4	13.3	0.2	5.5	11.0	-2.4	1.3	5.1
13 years	7.5	11.1	14.6	0.7	6.5	11.6	-2.8	1.2	5.5
14 years	5.8	9.5	13.1	-0.1	4.8	10.7	-3.0	0.5	3.9
15 years	6.0	9.8	13.7	0.3	5.6	10.7	-2.9	0.6	4.1
16 years	5.8	9.5	13.3	-0.2	4.7	10.4	-2.9	0.5	3.9
17 years	6.8	10.7	14.7	-0.2	4.6	10.2	-2.6	0.7	3.9
Girls									
12-17 years	5.9	9.9	13.8	-0.3	4.5	10.2	-3.1	0.5	4.1
12 years	5.7	9.9	14.0	-0.1	4.9	10.6	-3.7	0.0	3.8
13 years	6.3	10.4	14.5	0.5	6.1	11.2	-3.0	1.0	5.0
14 years	5.0	9.2	13.5	-0.2	4.6	10.0	-3.0	0.4	3.8
15 years	6.1	10.2	14.3	-0.3	4.6	10.3	-2.9	0.9	4.8
16 years	6.3	9.8	13.3	-1.0	3.2	9.1	-2.8	0.5	3.8
17 years	6.1	9.8	13.5	-0.6	3.8	9.6	-3.3	0.3	3.9

See footnotes at end of table.

Table 24. Medians and quartile points[1] in the distribution of hearing levels in decibels re audiometric zero (ANSI-1969) for the better ear at each test frequency and esimates for speech among youths in the Midwest, by age and sex: United States, 1966-70—Con.

Age and sex	2000 Hertz			3000 Hertz			4000 Hertz		
	P_{25}	Median	P_{75}	P_{25}	Median	P_{75}	P_{25}	Median	P_{75}
Both sexes	Decibels re audiometric zero (ANSI-1969)								
12-17 years	-3.5	0.5	4.4	-1.0	3.6	9.8	2.1	7.9	12.5
12 years	-3.5	0.4	4.4	-1.5	2.9	9.0	1.8	7.6	12.2
13 years	-3.8	0.3	4.5	-0.7	4.4	10.4	3.8	8.7	12.9
14 years	-3.6	0.3	4.2	-0.9	3.9	9.8	2.4	8.1	12.7
15 years	-3.3	0.8	5.0	-1.0	3.3	9.8	2.2	7.9	12.5
16 years	-3.4	0.5	4.4	-1.1	3.8	9.9	0.9	7.0	12.5
17 years	-3.3	0.5	4.3	-0.9	3.7	9.5	2.0	7.7	12.2
Boys									
12-17 years	-3.4	0.8	5.1	-0.2	5.1	10.9	2.7	8.4	13.1
12 years	-3.1	0.9	4.9	-0.8	4.1	10.3	1.8	7.7	12.6
13 years	-3.9	0.7	5.8	0.2	6.0	11.4	3.4	8.7	13.2
14 years	-3.4	0.6	4.7	-0.4	5.1	10.7	2.3	8.1	13.0
15 years	-3.7	0.7	5.2	-0.4	4.6	11.2	1.9	7.9	13.1
16 years	-3.5	0.8	5.0	-0.1	5.3	10.8	2.6	8.5	13.5
17 years	-2.8	1.2	5.8	0.4	5.8	10.9	5.1	9.3	13.5
Girls									
12-17 years	-3.6	0.2	3.9	-1.7	2.5	8.2	1.6	7.4	11.9
12 years	-4.0	-0.1	3.8	-2.1	2.0	7.3	1.9	7.5	11.9
13 years	-3.8	0.0	3.8	-1.4	3.2	9.2	4.2	8.7	12.6
14 years	-3.7	0.0	3.6	-1.4	2.9	8.6	2.6	8.0	12.4
15 years	-2.9	1.0	4.9	-1.5	2.2	7.3	2.6	7.9	12.0
16 years	-3.4	0.3	3.9	-2.0	2.5	8.6	-0.3	5.3	11.2
17 years	-3.8	-0.1	3.6	-1.7	2.3	7.6	0.3	6.2	10.8

See footnotes at end of table.

Table 24. Medians and quartile points[1] in the distribution of hearing levels in decibels re audiometric zero (ANSI-1969) for the better ear at each test frequency and estimates for speech among youths in the Midwest, by age and sex: United States, 1966-70—Con.

Age and sex	6000 Hertz			8000 Hertz			Speech[2]		
	P_{25}	Median	P_{75}	P_{25}	Median	P_{75}	P_{25}	Median	P_{75}
	Decibels re audiometric zero (ANSI-1969)								
Both sexes									
12-17 years	5.3	10.2	15.2	0.0	6.5	12.6	-0.8	3.3	9.1
12 years	3.7	9.1	13.8	-0.6	5.9	12.4	-0.9	3.3	9.0
13 years	5.4	10.4	15.8	0.6	7.3	13.4	-0.5	4.2	10.2
14 years	4.8	10.0	15.2	0.3	7.0	12.6	-1.0	3.0	8.6
15 years	6.1	10.8	16.2	0.0	6.5	13.0	-0.6	4.0	9.7
16 years	5.5	10.2	14.8	-0.7	5.9	11.9	-1.2	2.7	8.2
17 years	5.5	10.8	17.2	0.3	6.5	12.3	-1.0	3.0	8.5
Boys									
12-17 years	6.0	11.0	17.1	0.0	6.6	12.9	-0.8	3.5	9.4
12 years	5.0	9.8	14.6	-1.0	5.3	12.7	-0.9	3.1	8.9
13 years	6.3	11.0	16.5	0.3	7.0	13.0	-0.2	4.8	10.7
14 years	6.2	11.0	16.8	0.8	7.2	12.6	-0.8	3.4	9.3
15 years	5.9	10.7	16.4	0.0	6.8	13.2	-0.7	3.7	9.5
16 years	6.2	11.3	18.2	0.0	6.8	13.0	-1.1	2.8	8.6
17 years	6.0	12.7	20.3	0.0	5.8	12.4	-0.8	3.5	9.0
Girls									
12-17 years	4.3	9.4	14.2	0.0	6.5	12.4	-0.9	3.2	8.8
12 years	2.7	8.4	13.1	-0.2	6.4	12.2	-0.8	3.4	9.0
13 years	3.9	9.7	15.1	0.9	7.5	13.8	-0.6	3.7	9.7
14 years	2.6	8.8	14.2	-0.3	6.8	12.6	-1.2	2.7	8.0
15 years	6.3	10.9	16.1	0.1	6.2	12.7	-0.3	4.3	10.0
16 years	4.7	9.2	13.5	-1.3	5.1	10.9	-1.2	2.6	7.9
17 years	5.2	9.7	14.3	0.7	6.9	12.3	-1.2	2.7	7.9

[1] P_{25}, median, and P_{75} are the points in the distribution of hearing levels below which 25, 50, and 75 percent of the children, respectively fall.

[2] Average of hearing levels at 500, 1000, and 2000 Hertz.

Table 25. Medians and quartile points[1] in the distribution of hearing levels in decibels re audiometric zero (ANSI-1969) for the better ear at each test frequency and estimates for speech among youths in the South, by age and sex: United States, 1966-70

Age and sex	250 Hertz			500 Hertz			1000 Hertz		
	P_{25}	Median	P_{75}	P_{25}	Median	P_{75}	P_{25}	Median	P_{75}
Both sexes	Decibels re audiometric zero (ANSI-1969)								
12–17 years	3.8	8.9	13.4	0.9	6.7	11.8	-2.4	1.3	5.2
12 years	6.1	10.2	14.4	2.5	8.2	12.9	-2.1	1.9	7.1
13 years	3.1	9.0	14.1	1.9	7.7	12.6	-2.2	1.7	6.7
14 years	3.4	8.6	13.0	0.7	6.6	11.7	-2.4	1.5	6.0
15 years	1.8	7.8	12.8	0.1	5.4	11.3	-2.4	1.1	4.5
16 years	3.7	8.9	13.3	0.1	5.6	10.8	-2.6	0.9	4.5
17 years	4.8	8.9	12.8	0.6	6.3	11.4	-2.5	1.0	4.6
Boys									
12–17 years	4.0	8.9	13.3	0.8	6.7	11.8	-2.5	1.2	4.9
12 years	5.9	10.0	14.2	2.6	8.1	12.6	-2.3	1.5	6.0
13 years	2.8	8.6	13.2	1.7	7.5	12.2	-2.3	1.6	6.2
14 years	3.7	8.5	12.6	0.8	6.7	12.1	-2.3	1.4	5.3
15 years	1.1	7.5	12.8	0.1	5.4	11.3	-2.4	1.0	4.4
16 years	5.0	9.4	13.8	0.0	5.9	11.1	-2.8	1.0	4.7
17 years	5.3	9.2	13.0	0.3	5.9	11.3	-2.8	0.9	4.6
Girls									
12–17 years	3.7	9.0	13.6	0.9	6.7	11.9	-2.2	1.5	5.6
12 years	6.4	10.5	14.6	2.3	8.2	13.3	-1.8	2.4	8.1
13 years	3.4	9.7	15.6	2.0	8.0	13.1	-2.0	1.9	7.0
14 years	3.1	8.8	13.6	0.7	6.6	11.4	-2.5	1.6	6.5
15 years	2.5	8.1	12.8	0.1	5.3	11.4	-2.4	1.1	4.6
16 years	2.4	8.2	12.8	0.1	5.4	10.5	-2.5	0.9	4.2
17 years	3.8	8.6	12.6	0.9	6.6	11.5	-2.2	1.2	4.6

See footnotes at end of table.

Table 25. Medians and quartile points[1] in the distribution of hearing levels in decibels re audiometric zero (ANSI-1969) for the better ear at each test frequency and estimates for speech among youths in the South, by age and sex: United States, 1966-70—Con.

Age and sex	2000 Hertz			3000 Hertz			4000 Hertz		
	P_{25}	Median	P_{75}	P_{25}	Median	P_{75}	P_{25}	Median	P_{75}
	Decibels re audiometric zero (ANSI-1969)								
Both sexes									
12–17 years	-3.7	0.7	5.0	0.5	6.5	12.0	2.2	8.3	13.3
12 years	-3.3	0.8	4.9	1.2	7.2	12.3	4.7	9.3	13.7
13 years	-3.2	1.2	6.7	0.6	6.7	12.6	2.2	8.2	13.1
14 years	-3.5	1.1	6.7	0.5	6.3	11.6	2.2	8.2	13.2
15 years	-3.9	0.7	5.7	0.1	6.0	12.3	1.1	7.4	13.7
16 years	-3.9	0.2	4.2	0.5	6.6	12.0	2.0	8.2	13.4
17 years	-4.2	0.0	4.2	0.3	6.2	11.4	2.1	8.1	13.1
Boys									
12–17 years	-3.5	0.8	5.3	1.5	7.6	12.9	3.9	9.3	14.1
12 years	-2.8	1.5	6.7	2.1	8.0	13.0	5.5	9.7	13.9
13 years	-3.6	1.1	6.8	1.2	7.7	13.7	3.5	9.2	14.3
14 years	-3.3	0.8	4.9	1.2	7.0	11.9	3.0	8.5	13.0
15 years	-4.3	0.2	4.8	0.6	7.0	13.1	2.4	9.2	16.1
16 years	-4.2	0.2	4.7	1.6	7.8	13.2	2.9	9.1	14.4
17 years	-2.9	1.0	4.9	2.6	8.1	12.5	5.5	9.8	14.0
Girls									
12–17 years	-3.8	0.5	4.9	-0.2	5.2	11.1	1.1	7.1	12.5
12 years	-3.7	0.2	4.1	0.4	6.2	11.6	3.3	8.7	13.3
13 years	-2.9	1.4	6.6	0.0	5.6	11.5	1.3	7.1	11.9
14 years	-3.7	1.5	8.0	0.1	5.6	11.3	1.6	7.8	13.4
15 years	-3.6	1.1	6.7	-0.3	4.9	11.5	0.2	5.6	12.0
16 years	-3.5	0.1	3.8	-0.4	4.9	10.4	1.3	7.1	12.2
17 years	-6.4	-1.2	3.4	-1.1	3.8	14.7	-0.3	5.8	11.6

See footnotes at end of table.

Table 25. Medians and quartile points[1] in the distribution of hearing levels in decibels re audiometric zero (ANSI-1969) for the better ear at each test frequency and estimates for speech among youths in the South, by age and sex: United States, 1966-70—Con.

Age and sex	6000 Hertz			8000 Hertz			Speech[2]		
	P_{25}	Median	P_{75}	P_{25}	Median	P_{75}	P_{25}	Median	P_{75}
	Decibels re audiometric zero (ANSI-1969)								
Both sexes									
12–17 years	5.4	11.0	18.2	1.2	7.9	13.8	-0.2	4.7	10.4
12 years	5.4	10.6	17.0	2.7	8.8	13.9	0.6	6.1	11.2
13 years	5.1	10.9	18.2	2.1	8.5	14.1	0.0	5.0	10.9
14 years	3.9	10.6	18.1	0.2	7.0	13.0	-0.1	5.1	10.6
15 years	5.4	11.1	18.7	1.0	8.1	14.4	-0.4	4.4	10.2
16 years	6.3	11.6	18.9	0.2	7.0	13.5	-0.7	3.7	9.6
17 years	5.8	11.2	18.2	1.3	7.8	13.7	-0.6	3.9	9.8
Boys									
12–17 years	6.4	12.3	20.3	1.5	8.5	14.7	-0.2	4.7	10.5
12 years	5.3	11.0	18.6	3.4	9.5	14.8	1.0	6.6	11.4
13 years	6.0	12.0	20.2	3.8	10.2	17.1	-0.2	4.7	10.9
14 years	4.1	11.0	19.0	0.6	6.7	13.6	-0.4	4.4	10.1
15 years	6.7	12.6	20.9	0.7	8.4	15.6	-0.5	4.1	9.9
16 years	7.3	12.9	20.8	0.0	7.0	14.0	-0.6	3.9	10.1
17 years	8.5	14.4	21.6	2.4	8.9	14.7	-0.2	4.7	10.3
Girls									
12–17 years	4.0	9.8	15.3	0.8	7.3	12.9	-0.2	4.6	10.3
12 years	5.5	10.3	15.3	2.1	8.2	13.0	0.3	5.6	10.9
13 years	3.9	9.9	15.8	1.0	6.9	12.3	0.2	5.5	10.9
14 years	3.7	10.2	17.2	0.1	7.2	12.8	0.3	5.7	10.9
15 years	3.5	9.8	16.1	1.2	7.8	13.7	-0.2	4.8	10.6
16 years	5.2	10.2	15.8	0.4	7.0	12.9	-0.8	3.4	9.0
17 years	2.1	8.4	13.3	0.4	6.5	12.6	-1.0	3.2	9.0

[1] P_{25}, median, and P_{75} are the points in the distribution of hearing levels below which 25, 50, and 75 percent of the children, respectively fall.

[2] Average of hearing levels at 500, 1000, and 2000 Hertz.

Table 26. Medians and quartile points[1] in the distribution of hearing levels in decibels re audiometric zero (ANSI-1969) for the better ear at each test frequency and estimates for speech among youths in the West, by age and sex: United States, 1966-70

Age and sex	250 Hertz			500 Hertz			1000 Hertz		
	P_{25}	Median	P_{75}	P_{25}	Median	P_{75}	P_{25}	Median	P_{75}
Both sexes	Decibels re audiometric zero (ANSI-1969)								
12–17 years	5.6	9.4	13.2	-0.1	5.0	10.5	-2.6	1.1	4.7
12 years	5.3	9.1	13.0	-0.1	5.1	10.8	-2.4	1.3	4.9
13 years	5.3	9.3	13.2	-0.4	4.5	10.1	-3.0	0.7	4.5
14 years	6.0	9.6	13.1	0.0	5.3	10.6	-2.4	1.3	5.0
15 years	5.7	9.5	13.3	-0.1	4.9	10.4	-2.6	0.9	4.4
16 years	5.9	9.7	13.4	0.3	5.9	10.9	-2.5	1.1	4.8
17 years	5.6	9.4	13.2	-0.5	4.2	10.0	-2.5	1.2	4.9
Boys									
12–17 years	5.7	9.4	13.1	0.2	5.6	10.8	-2.4	1.3	5.0
12 years	4.0	8.7	12.8	-0.1	5.2	10.7	-2.5	1.0	4.4
13 years	5.5	9.3	13.1	-0.2	5.0	10.6	-2.6	1.2	5.2
14 years	6.2	9.6	12.9	1.1	6.7	11.3	-2.1	1.5	5.3
15 years	5.5	9.5	13.4	0.5	6.0	11.2	-2.3	1.6	6.1
16 years	6.2	9.6	12.9	1.2	6.9	11.3	-2.4	1.3	5.0
17 years	5.8	9.6	13.3	-0.7	3.5	9.3	-2.2	1.4	5.0
Girls									
12–17 years	5.6	9.5	13.3	-0.4	4.4	10.2	-2.8	0.9	4.5
12 years	6.1	9.6	13.2	-0.1	4.9	11.1	-2.2	1.6	6.3
13 years	5.1	9.2	13.3	-0.5	4.0	9.6	-3.4	0.3	3.9
14 years	5.8	9.6	13.3	-0.8	3.8	9.7	-2.7	1.1	4.9
15 years	5.8	9.5	13.2	-0.6	4.0	9.6	-2.8	0.4	3.5
16 years	5.6	9.8	14.0	-0.4	4.8	10.5	-2.6	1.0	4.6
17 years	5.3	9.2	13.1	-0.2	5.2	10.8	-2.8	1.0	4.8

See footnotes at end of table.

Table 26. Medians and quartile points[1] in the distribution of hearing levels in decibels re audiometric zero (ANSI-1969) for the better ear at each test frequency and estimates for speech among youths in the West, by age and sex: United States, 1966-70—Con.

Age and sex	2000 Hertz			3000 Hertz			4000 Hertz		
	P_{25}	Median	P_{75}	P_{25}	Median	P_{75}	P_{25}	Median	P_{75}
Both sexes	Decibels re audiometric zero (ANSI-1969)								
12–17 years	-3.3	0.7	4.7	-1.2	3.4	9.7	2.2	8.1	13.1
12 years	-3.7	0.4	4.4	-1.4	3.4	9.9	2.1	8.1	13.1
13 years	-3.9	0.2	4.3	-1.6	2.8	9.1	1.5	7.4	12.5
14 years	-2.7	0.9	4.5	-1.5	3.4	9.8	1.8	7.7	12.8
15 years	-3.2	0.8	4.7	-1.1	3.5	9.5	2.7	8.4	13.2
16 years	-3.2	1.0	5.6	-1.1	3.6	9.8	2.4	8.4	13.6
17 years	-3.3	0.9	5.2	-0.7	4.2	10.2	2.8	8.5	13.3
Boys									
12–17 years	-3.0	1.0	5.0	-0.4	4.8	10.8	3.9	9.2	13.9
12 years	-3.1	0.6	4.3	-0.9	4.3	10.5	3.2	8.8	13.6
13 years	-3.6	0.5	4.6	-0.6	4.0	10.7	4.2	9.0	13.4
14 years	-2.5	1.4	5.7	0.2	6.1	11.5	3.9	9.2	13.9
15 years	-3.0	1.5	6.9	-0.4	4.7	10.5	4.7	9.5	14.0
16 years	-2.9	1.2	5.8	-0.3	5.3	11.0	3.8	9.5	14.6
17 years	-3.0	0.9	4.8	0.0	5.0	10.7	4.0	9.3	14.1
Girls									
12–17 years	-3.6	0.4	4.4	-2.0	2.3	8.1	0.9	6.8	12.1
12 years	-4.4	0.0	4.5	-1.9	2.5	9.1	1.2	7.2	12.4
13 years	-4.2	-0.1	3.9	-2.4	1.6	6.8	-0.1	5.2	11.2
14 years	-2.9	0.4	3.8	-2.8	1.5	6.6	0.5	6.0	11.4
15 years	-3.4	0.2	3.8	-1.7	2.5	8.2	1.4	7.3	12.3
16 years	-3.4	0.9	5.4	-1.5	2.5	8.2	1.4	7.5	12.6
17 years	-3.5	1.0	6.1	-1.5	3.2	9.4	1.5	7.6	12.3

See footnotes at end of table.

Table 26. Medians and quartile points[1] in the distribution of hearing levels in decibels re audiometric zero (ANSI-1969) for the better ear at each test frequency and estimates for speech among youths in the West, by age and sex: United States, 1966-70—Con.

Age and sex	6000 Hertz			8000 Hertz			Speech[2]		
	P_{25}	Median	P_{75}	P_{25}	Median	P_{75}	P_{25}	Median	P_{75}
Both sexes	Decibels re audiometric zero (ANSI-1969)								
12–17 years	5.7	10.9	17.4	-1.6	4.4	11.4	-0.5	4.0	9.8
12 years	5.3	10.1	14.9	-0.7	5.8	11.8	-0.4	4.4	10.3
13 years	4.4	10.1	16.1	-1.7	4.3	11.3	-0.8	3.3	9.0
14 years	6.2	11.4	18.1	-1.2	4.8	11.8	-0.4	4.3	10.0
15 years	5.4	10.9	17.3	-1.9	3.6	11.3	-0.4	4.2	9.7
16 years	6.7	12.2	19.5	-1.4	4.6	11.1	-0.5	4.2	10.0
17 years	5.8	10.9	17.2	-2.6	3.2	10.5	-0.6	3.9	9.8
Boys									
12–17 years	6.3	11.7	19.2	-1.2	5.3	12.0	-0.3	4.5	10.1
12 years	5.2	10.3	16.8	-0.4	6.4	12.4	-0.4	4.2	10.3
13 years	5.5	10.9	18.0	-1.4	5.0	11.9	-0.5	4.1	9.7
14 years	7.2	12.4	19.8	-1.1	5.3	12.2	0.3	5.6	10.7
15 years	6.2	12.0	19.3	-1.4	5.0	12.6	0.0	5.0	10.4
16 years	7.4	13.4	20.6	-0.2	5.9	11.6	-0.4	4.4	10.0
17 years	6.7	12.0	19.0	-2.5	3.8	11.1	-0.7	3.7	9.6
Girls									
12–17 years	5.1	10.1	15.3	-2.0	3.6	10.6	-0.7	3.6	9.5
12 years	5.3	9.8	14.3	-1.0	5.1	11.2	-0.3	4.5	10.3
13 years	3.2	9.3	14.6	-1.9	3.6	10.8	-1.2	2.7	8.1
14 years	5.2	10.4	16.3	-1.3	4.3	11.3	-0.8	3.3	9.2
15 years	4.4	9.9	15.0	-2.3	2.5	9.8	-0.8	3.6	9.0
16 years	6.3	11.4	18.2	-2.4	3.5	10.5	-0.6	4.0	10.0
17 years	4.6	9.7	14.7	-2.7	2.5	9.7	-0.5	4.1	10.0

[1] P_{25}, median, and P_{75} are the points in the distribution of hearing levels below which 25, 50, and 75 percent of the children, respectively fall.

[2] Average of hearing levels at 500, 1000, and 2000 Hertz.

Table 27. Mean hearing levels in decibels re audiometric zero (ANSI-1969) for the better ear at each test frequency among youths in urban and rural areas, by age and sex: United States, 1966-70

Age and sex	Urban areas								Rural areas							
	Hertz								Hertz							
	250	500	1000	2000	3000	4000	6000	8000	250	500	1000	2000	3000	4000	6000	8000
Both sexes	Decibels re audiometric zero (ANSI-1969)								Decibels re audiometric zero (ANSI-1969)							
12-17 years	9.4	6.0	1.6	1.0	5.2	7.8	10.8	6.2	8.8	5.7	1.5	1.2	5.6	8.4	11.9	7.5
12 years	9.4	6.4	2.0	1.0	5.1	7.8	9.9	6.4	9.1	6.4	1.8	1.1	5.4	8.3	11.0	8.2
13 years	9.7	6.2	1.7	0.8	5.2	8.0	10.4	7.0	9.0	6.0	1.8	1.6	6.0	9.0	11.9	7.4
14 years	8.9	5.8	1.6	1.0	5.0	7.4	10.4	6.0	8.5	6.0	1.6	1.4	5.7	8.0	11.6	7.4
15 years	9.2	6.1	1.6	1.2	5.2	7.8	11.0	6.2	8.6	5.6	1.4	1.4	6.2	8.3	12.0	7.9
16 years	9.4	5.8	1.6	1.2	5.0	7.6	11.4	5.8	8.4	5.0	1.4	0.8	5.8	8.6	13.4	7.0
17 years	9.7	5.6	1.4	1.1	5.2	8.2	11.4	6.0	9.0	5.2	0.9	0.7	4.8	7.8	11.5	7.2
Boys																
12-17 years	9.4	6.3	2.0	1.5	6.2	8.7	11.8	6.6	8.8	5.8	1.6	1.6	7.0	10.0	13.9	9.0
12 years	9.3	7.0	2.4	1.8	6.3	8.6	10.6	6.7	8.6	5.8	1.8	1.6	6.3	9.6	12.9	9.6
13 years	9.2	6.0	1.8	1.0	6.0	8.4	11.0	6.9	9.2	6.6	2.6	2.7	8.0	10.8	13.8	9.6
14 years	9.0	6.2	1.9	1.5	6.2	8.4	11.6	6.2	8.3	6.3	1.7	1.2	6.6	8.8	12.8	8.0
15 years	9.0	6.2	1.8	1.6	6.2	8.4	11.9	6.6	8.8	6.0	1.3	1.6	7.6	10.6	13.9	9.5
16 years	9.6	6.4	1.9	1.6	6.4	8.8	12.8	6.4	8.4	4.9	1.2	0.4	7.2	9.8	15.7	9.0
17 years	9.9	5.7	2.0	1.4	6.3	9.8	13.7	6.7	9.0	5.3	1.0	1.8	6.0	10.0	14.4	7.9
Girls																
12-17 years	9.4	5.8	1.3	0.6	4.0	6.8	9.6	6.0	8.8	5.6	1.4	0.6	4.2	6.6	9.7	5.9
12 years	9.4	5.8	1.6	0.3	3.9	6.9	9.1	6.0	9.6	7.0	1.8	0.6	4.6	7.0	9.0	6.6
13 years	10.2	6.4	1.7	0.8	4.6	7.5	9.8	7.2	8.6	5.4	0.9	0.2	3.8	6.8	9.7	5.0
14 years	8.8	5.4	1.3	0.4	3.6	6.6	9.2	5.8	8.7	5.6	1.4	1.4	4.8	7.3	10.5	6.6
15 years	9.3	6.0	1.2	0.8	4.2	7.2	10.0	5.8	8.5	5.2	1.6	1.1	4.6	5.9	10.1	6.2
16 years	9.2	5.3	1.2	0.8	3.7	6.4	10.3	5.2	8.3	5.0	1.5	1.1	3.9	7.2	10.6	4.4
17 years	9.4	5.6	1.0	0.8	4.2	6.6	9.2	5.3	8.8	4.9	0.8	-0.4	3.4	5.4	8.4	6.3

Table 28. Mean hearing levels in decibels re audiometric zero (ANSI-1969) for the better ear at each test frequency among youths in urban areas, by population size of place of residence, age, and sex: United States, 1966-70

Frequency, age, and sex	Urbanized areas				Urban places outside urbanized areas		
	3 million or more	1-2.9 million	250,000 999,999	Less than 250,000	25,000 or more	10,000-24,999	2,500-9,999
	Decibels re audiometric zero (ANSI-1969)						
250 Hertz							
Both sexes 12-17 years	[illegible]	10.4	8.7	11.0	8.6	10.6	9.9
Boys 12-17 years	7.9	10.6	8.6	11.1	8.6	10.6	10.4
Girls 12-17 years	8.7	10.1	8.8	11.0	8.6	10.8	9.4
500 Hertz							
Both sexes 12-17 years	5.6	6.2	5.8	6.6	5.9	7.1	6.0
Boys 12-17 years	5.8	6.5	5.9	6.7	6.6	7.3	6.6
Girls 12-17 years	5.4	6.0	5.8	6.4	5.2	6.8	5.4
1000 Hertz							
Both sexes 12-17 years	1.5	1.0	2.2	1.9	2.0	2.8	1.5
Boys 12-17 years	1.6	1.2	2.6	2.2	3.0	3.0	2.0
Girls 12-17 years	1.4	0.7	1.8	1.6	1.0	2.6	1.0
2000 Hertz							
Both sexes 12-17 years	0.5	1.0	0.1	3.1	2.0	2.4	1.1
Boys 12-17 years	1.0	1.0	0.7	4.1	2.6	2.8	1.5
Girls 12-17 years	0.0	1.1	-0.5	2.2	1.4	2.0	0.8
3000 Hertz							
Both sexes 12-17 years	5.2	5.1	4.2	6.2	5.2	5.6	5.4
Boys 12-17 years	5.8	5.8	5.8	7.6	6.8	6.6	7.1
Girls 12-17 years	4.4	4.4	2.8	4.8	3.8	4.4	3.8
4000 Hertz							
Both sexes 12-17 years	6.9	7.6	7.8	9.0	7.0	9.5	9.0
Boys 12-17 years	7.4	8.2	9.4	9.8	8.0	10.7	11.0
Girls 12-17 years	6.5	7.2	6.4	8.1	6.0	8.2	7.2
6000 Hertz							
Both sexes 12-17 years	9.1	10.8	12.4	10.6	9.5	13.7	11.8
Boys 12-17 years	9.6	11.1	13.6	12.6	11.9	16.4	14.0
Girls 12-17 years	8.6	10.5	11.3	8.8	7.3	10.6	9.8
8000 Hertz							
Both sexes 12-17 years	4.8	6.2	7.4	7.6	5.8	7.0	7.4
Boys 12-17 years	4.7	6.2	8.0	7.8	6.2	8.5	8.7
Girls 12-17 years	4.8	6.2	6.8	7.5	5.2	5.4	6.4
Speech[1]							
Both sexes 12-17 years	4.8	4.9	5.0	6.0	5.6	6.0	5.0
Boys 12-17 years	5.0	5.1	5.2	6.6	6.3	6.4	5.6
Girls 12-17 years	4.6	4.7	4.6	5.6	4.9	5.7	4.6

[1]Average of hearing levels at 500, 1000, and 2000 Hertz.

Table 29. Mean hearing levels in decibels re audiometric zero (ANSI-1969) for the better ear at each test frequency and estimates for speech among youths, by rate of population change in place of residence from 1950 to 1960 and age: United States, 1966-70

Rate of population change and age	Hertz								
	250	500	1000	2000	3000	4000	6000	8000	Speech[1]
	Decibels re audiometric zero (ANSI-1969)								
Loss									
12–17 years	8.9	6.4	1.7	1.2	6.0	8.3	11.9	8.0	5.3
12 years	9.2	7.4	2.0	0.8	5.4	7.6	10.6	8.4	5.6
13 years	9.0	6.5	1.6	1.1	5.7	7.8	11.4	7.6	5.4
14 years	8.8	6.6	1.8	1.6	6.3	8.4	11.7	8.2	5.4
15 years	8.7	6.4	1.6	1.2	6.1	8.6	13.0	8.6	5.3
16 years	9.2	6.2	2.2	1.6	6.8	9.4	13.7	8.6	5.4
17 years	8.6	5.4	1.2	0.6	5.4	8.1	11.5	6.9	4.7
Below-average gain									
12–17 years	9.1	5.8	1.7	1.8	5.2	7.8	11.4	6.3	5.4
12 years	9.2	6.4	2.5	2.4	6.0	8.4	11.1	6.8	6.0
13 years	9.5	6.0	1.6	2.2	5.6	8.8	12.0	7.5	5.4
14 years	8.9	5.7	2.0	1.6	4.8	7.9	11.1	6.0	5.4
15 years	9.4	6.2	1.6	2.0	5.4	7.2	11.4	6.4	5.4
16 years	8.8	5.4	1.3	1.1	4.2	6.6	11.2	5.6	4.8
17 years	8.8	5.4	1.3	1.6	4.6	8.2	11.9	5.6	5.0
Average gain									
12–17 years	10.6	6.2	2.0	0.8	5.6	9.0	10.9	7.8	5.2
12 years	10.4	6.2	1.8	0.2	5.2	8.9	10.6	8.2	5.0
13 years	11.0	6.5	2.7	0.4	5.6	8.8	10.2	7.9	5.4
14 years	10.2	5.8	1.4	0.8	5.3	8.5	10.5	7.6	5.1
15 years	10.4	6.6	1.6	0.8	5.9	9.0	11.1	8.4	5.4
16 years	10.8	6.0	2.1	1.4	5.8	9.4	11.6	6.9	5.3
17 years	11.2	6.0	1.8	1.6	5.8	9.3	11.8	8.2	5.2
Above-average gain									
12–17 years	8.0	5.2	1.0	0.6	4.8	7.0	10.4	4.9	4.4
12 years	8.1	5.6	1.5	1.0	4.5	6.8	8.8	4.6	5.0
13 years	8.3	5.6	1.0	0.9	5.2	8.1	10.4	6.0	4.6
14 years	7.3	5.4	1.2	0.4	4.6	6.2	10.4	4.6	4.6
15 years	7.8	5.0	1.2	1.0	4.9	7.4	10.2	4.6	4.6
16 years	7.6	4.7	0.5	0.2	4.4	6.6	12.2	4.4	3.8
17 years	9.3	5.1	0.8	0.0	4.6	6.8	10.6	5.2	4.2

[1]Average of hearing levels at 500, 1000, and 2000 Hertz.

Table 30. Mean hearing levels in decibels re audiometric zero (ANSI-1969) for the better ear at each test frequency and estimates for speech among youths by annual family income, age, and sex: United States, 1966-70

Frequency, age, and sex	Family income					
	Less than $3,000	$3,000-$4,999	$5,000-$6,999	$7,000-$9,999	$10,000-$14,999	$15,000 or more
	Decibels re audiometric zero (ANSI-1969)					
250 Hertz						
Both sexes 12-17 years	10.0	9.8	9.0	9.1	8.7	8.8
Boys 12-17 years	10.0	9.4	8.9	9.2	8.6	9.0
Girls 12-17 years	10.0	10.2	9.0	9.0	8.8	8.6
500 Hertz						
Both sexes 12-17 years	7.0	6.9	6.0	5.8	5.1	5.0
Boys 12-17 years	6.7	6.9	6.4	6.0	5.4	5.6
Girls 12-17 years	7.2	6.9	5.6	5.6	4.9	4.2
1000 Hertz						
Both sexes 12-17 years	3.1	2.6	1.6	1.6	0.8	0.2
Boys 12-17 years	3.5	2.5	2.2	1.9	1.0	0.3
Girls 12-17 years	2.8	2.8	1.1	1.2	0.6	0.0
2000 Hertz						
Both sexes 12-17 years	2.6	1.9	1.0	0.8	0.4	0.1
Boys 12-17 years	3.1	2.5	1.6	1.2	0.7	0.4
Girls 12-17 years	2.2	1.4	0.5	0.3	0.2	-0.3
3000 Hertz						
Both sexes 12-17 years	7.3	6.6	5.2	4.2	4.4	4.1
Boys 12-17 years	8.4	7.8	6.8	6.0	5.6	4.8
Girls 12-17 years	6.2	5.4	3.7	3.6	3.2	3.4
4000 Hertz						
Both sexes 12-17 years	9.9	9.2	8.0	7.6	6.8	6.4
Boys 12-17 years	11.6	10.5	9.4	8.7	7.8	7.0
Girls 12-17 years	8.4	7.9	6.6	6.4	5.9	5.8
6000 Hertz						
Both sexes 12-17 years	12.2	11.8	11.1	10.9	10.4	11.0
Boys 12-17 years	14.2	13.4	13.0	12.2	11.6	12.0
Girls 12-17 years	10.6	10.2	9.2	9.5	9.2	9.8
8000 Hertz						
Both sexes 12-17 years	8.4	7.8	6.6	6.6	6.0	5.2
Boys 12-17 years	9.4	8.8	7.4	7.3	6.4	5.3
Girls 12-17 years	7.6	6.8	5.8	5.8	5.5	5.0
Speech[1]						
Both sexes 12-17 years	6.4	6.1	5.1	5.0	4.3	3.9
Boys 12-17 years	6.6	6.2	5.5	5.3	4.5	4.2
Girls 12-17 years	6.2	5.9	4.7	4.5	4.1	3.5

[1] Average of hearing levels at 500, 1000, and 2000 Hertz.

Table 31. Mean hearing levels in decibels re audiometric zero (ANSI-1969) for the better ear at each test frequency and estimates for speech among youths, by education of parent, age, and sex: United States, 1966-70

Frequency, age, and sex	Years of schooling completed							
	Less than 5	5–7	8	9–11	12	13–15	16	17 or more
	Decibels re audiometric zero (ANSI-1969)							
250 Hertz								
Both sexes 12–17 years	10.1	9.2	9.4	9.4	9.0	9.0	8.4	8.4
Boys 12–17 years	9.8	9.2	9.2	9.3	9.0	9.0	8.7	8.2
Girls 12–17 years	10.4	9.2	9.8	9.4	9.0	9.0	8.1	8.6
500 Hertz								
Both sexes 12–17 years	7.6	7.0	5.9	6.4	5.6	5.1	4.6	4.8
Boys 12–17 years	7.2	7.4	5.7	6.6	5.8	5.3	5.2	5.7
Girls 12–17 years	8.0	6.8	6.1	6.2	5.3	4.9	4.2	3.6
1000 Hertz								
Both sexes 12–17 years	3.7	2.6	1.5	2.3	1.2	0.6	0.0	0.4
Boys 12–17 years	3.7	3.4	1.5	2.4	1.6	0.6	1.0	0.2
Girls 12–17 years	3.7	1.9	1.5	2.1	0.8	0.6	-0.8	0.6
2000 Hertz								
Both sexes 12–17 years	2.9	1.8	1.2	1.8	0.8	0.0	-0.2	-0.4
Boys 12–17 years	3.5	2.6	0.9	2.4	1.4	0.4	0.5	-0.4
Girls 12–17 years	2.4	1.1	1.4	1.2	0.2	-0.4	-0.8	-0.3
3000 Hertz								
Both sexes 12–17 years	8.0	6.9	5.2	5.8	4.8	4.0	4.5	3.6
Boys 12–17 years	9.6	8.2	6.0	7.0	6.2	4.8	6.2	4.0
Girls 12–17 years	6.4	5.6	4.4	4.6	3.3	3.2	3.0	2.8
4000 Hertz								
Both sexes 12–17 years	10.4	9.0	8.3	8.5	7.6	6.8	7.0	6.4
Boys 12–17 years	12.2	10.6	9.3	10.0	8.4	7.6	8.6	7.4
Girls 12–17 years	8.6	7.2	7.4	7.0	6.6	6.0	5.6	5.1
6000 Hertz								
Both sexes 12–17 years	12.7	12.0	11.5	11.4	11.0	9.8	10.6	10.3
Boys 12–17 years	15.0	13.8	13.2	12.8	12.2	10.5	12.0	12.1
Girls 12–17 years	10.6	10.0	9.8	9.9	9.6	9.1	9.3	7.8
8000 Hertz								
Both sexes 12–17 years	9.1	8.1	7.2	7.2	6.4	4.9	6.3	4.1
Boys 12–17 years	10.8	9.6	7.6	8.4	7.0	5.0	7.0	4.8
Girls 12–17 years	7.6	6.6	6.9	6.1	5.7	4.8	5.6	3.2

APPENDIX I

STATISTICAL NOTES

The Survey Design

The sample design for the first three programs or Cycles I-III of the Health Examination Survey has been essentially similar in that each has been a multistage, stratified probability sample of clusters of households in land-based segments. The successive elements for this sample design are primary sampling units, census enumeration district, segment (a cluster of households), eligible persons, and finally the sample person.

The 40 sample areas and the segments utilized in the design of Cycle III were the same as those in Cycle II. Previous reports describe in detail the sample design used for Cycle II and in addition discuss the problems and considerations given to other types of sampling frames, cluster versus random sampling, and whether or not to control the selection of siblings.[4,6]

Requirements and limitations placed on the design for Cycle III, similar to those for children in Cycle II, were that:

1. The target population be defined as the civilian noninstitutionalized population of the United States, including Alaska and Hawaii, between the ages of 12 and 17 years for Cycle III, with the special exclusion of children residing on reservation lands of the American Indians because of operational problems encountered on these lands in Cycle I.
2. The time period of data collection be limited to about 3 years for each cycle and the length of the individual examination within the specially constructed mobile examination center be between 2 and 3 hours.
3. Ancillary data be collected on specially designed household, medical history, and school questionnaires and from birth certificate copies.
4. Examination objectives be related primarily to factors of physical and intellectual growth and development.
5. The sample be sufficiently large to yield reliable findings within broad geographic regions and population density groups as well as age, sex, and limited socioeconomic groups for the total sample.

The sample was drawn jointly with the Bureau of the Census starting with the 1960 decennial census list of addresses and the nearly 2,900 primary sampling units (PSU's) into which the entire United States was divided. Each PSU is either a standard metropolitan statistical area (SMSA), a county, or a group of two or three contiguous counties. These PSU's were grouped into 40 strata, each stratum having an average size of about 4.5 million persons, in such a manner as to maximize the degree of homogeneity within strata with regard to the population size of the PSU's, degree of urbanization, geographic proximity, and degree of industrialization. The 40 strata were then classified into four broad geographic regions of 10 strata each and were then, within each region, cross-classified by four

population density classes and classes of rate of population change from 1950 to 1960. Using a modified Goodman-Kish controlled-selection technique, one PSU was drawn from each of the 40 strata.

Further stages of sampling within PSU's required first the selection of census enumeration districts (ED's). The ED's are small well-defined areas of about 250 housing units into which the entire Nation was divided for the 1960 population census. Each ED was assigned a "measure of size" equal to the rounded whole number resulting from a "division by nine" of the number of children aged 5-9 in the ED at the time of the 1960 census. A sample of 20 ED's in the sample PSU were selected by systematic sampling, each ED having a probability of selection proportional to the population of children 5-9 years at the time of the 1960 census date. A further random selection by size of segments (smaller clusters of housing units) within each ED was then made.

Because of the 3-year time interval between Cycle II and Cycle III, the Cycle III frame had to be supplemented for new construction and to compensate for segments where housing was partially or totally demolished to make room for highway construction or urban redevelopment.

Advanced planning for the examinations at the various locations or stands provided for about 17 days of examinations which limited the number of examinees per location to approximately 200. When the number of eligible youths in the sample drawn for a particular location exceeded this number, subsampling was done by deleting from the master list of eligible youths (ordered by segment, household order within segment, and age within household) every nth name on the list starting with the yth name, y being a number between 1 and n selected randomly and n being the extent of oversampling in the original draw.

In Cycle III, as in Cycle II, twins who were deleted in the sample selection, were also scheduled for examination, time permitting, as were youths deleted from the Cycle III sample who had been examined in Cycle II. The sample was selected in Cycle III, as it has been for the children in Cycle II, so as to contain the correct proportion of youths from families having only one eligible youth, two eligible youths, and so on to be representative of the total target population. However, since households were one of the elements in the sample frame, the number of related youths in the resultant sample is greater than would come from a design which sampled youths 12-17 years without regard to household. The resultant estimated mean measurements or rates should be unbiased, but their sampling variability will be somewhat greater than those from more costly, time-consuming systematic sample designs in which every kth youth would be selected.

The total probability sample for Cycle III included 7,514 youths representative of the approximately 22.7 million noninstitutionalized United States youths of 12-17 years. The sample contained youths from 25 different States and approximately 1,000 in each single year of age.

The response rate in Cycle III was 90 percent, with 6,768 youths examined out of the total sample. These examinees were closely representative of those in the sample as well as the population from which the sample were drawn with respect to age, sex, race, region, population density, and population growth in area of residence. Hence it appears unlikely that nonresponse could bias the findings appreciably.

Measure used to control the quality of the data from these surveys have been cited previously;[6,24] those additional measures specifically related to the testing of hearing are outlined in an earlier section of this report.

Reliability

While measurement processes in the surveys were carefully standardized and closely controlled, the correspondence between the real world and survey results cannot be expected to be exact. Survey data are imperfect for three major reasons: (1) results are subject to sampling error, (2) the actual conduct of a survey never agrees perfectly with the design, and (3) the measurement processes themselves are inexact even though standardized and controlled.

The first report on Cycle III[6] describes in detail the faithfulness with which the sampling design was carried out.

Data recorded for each sample youth are inflated in the estimation process to characterize the larger universe of which the sample youth is representative. The weights used in this inflation process are a product of the reciprocal of the probability of selecting the youth, an adjustment for nonresponse cases, and a poststratified ratio adjustment which increases precision by bringing survey results into closer alignment with known United States population figure by color and sex within single years of age 12 through 17 for the youth's survey.

In the third cycle of the Health Examination Survey (as for the children in Cycle II) the samples were the results of three principal stages of selection—the single PSU from each stratum, the 20 segments from each sample PSU, and the sample youth from the eligible persons. The probability of selecting an individual youth is the product of the probability of selection at each stage.

Since the strata are roughly equal in population size and a nearly equal number of sample youths were examined in each of the sample PSU's, the sample design is essentially self-wieghting with respect of the target population; that is, each youth 12 through 17 years had about the same probability of being drawn into the respective samples.

The adjustment upward for nonresponse is intended to minimize the impact of nonresponse on final estimates by imputing to nonrespondents the characteristics of "similar" respondents. Here "similar" respondents were judged to be examined youths in a sample PSU having the same age (in years) and sex as youths not examined in that sample PSU.

The poststratified ratio adjustment used in the third cycle achieved most of the gains in precision which would have been attained if the sample had been drawn from a population stratified by age, color, and sex and makes the final sample estimates of population agree exactly with independent controls prepared by the Bureau of the Census for the United States noninstitutionalized population as of March 9, 1968 (approximate midsurvey point for Cycle III), by color and sex for each single year of age 12-17. The sampling weight of every responding sample youth in each of the 24 age, color, and sex classes is adjusted upwards or downwards so that the weighted total within the class equals the independent population control for each survey.

In addition to youths not examined at all, there were some whose examinations were incomplete in one frequency or another. If the technician considered some parts of the test unreliable

Table I. Missing hearing test data, by age of examinee: Health Examination Survey, 1966-69

Hearing test missing	All examinees, 12-17 years	12 years	13 years	14 years	15 years	16 years	17 years
All frequencies (number of youths for whom one or more test parts are incomplete)	38	7	8	5	8	6	4
	Number of ears						
Test incomplete for frequencies of:							
250 Hertz	45	7	10	5	10	10	3
500 Hertz	45	8	8	5	11	10	3
1000 Hertz	46	8	8	5	10	12	3
2000 Hertz	46	8	8	6	10	10	4
3000 Hertz	47	8	11	5	10	10	3
4000 Hertz	48	[illegible]	10	5	10	10	4
6000 Hertz	46	7	10	5	12	10	2
8000 Hertz	52	9	12	7	12	10	2

because of physical or mental reasons or t audiometer was not functioning properly, the test parts affected were also not used. The extent of missing data for the hearing tests is shown in table I.

For each of the examined youths not given the hearing test, a respondent of the same age-sex-race group was selected at random and his test results assigned to the nonexamined person.

When only incomplete test results were available (38 youths), a variety of methods were used, depending upon the extent of missing data. If only one ear was tested, it was assumed that the findings for the other ear would have been the same. If partial results were available, the levels reached by the other ear at the particular frequencies were used as the estimates if they were consistent with the audiogram for the ear on which data were missing. Otherwise, projections were made on the basis of the parts of the audiogram available.

Sampling and Measurement Error

In the present report, reference has been made to efforts to minimize bias and variability of measurement techniques.

The probability design of the survey makes possible the calculation of sampling errors. The sampling error is used here to determine how imprecise the survey test results may be because they come from a sample rather than from the measurements of all elements in the universe.

The estimation of sampling errors for a study of the type of the Health Examination Survey is difficult for at least three reasons: (1) measurement error and "pure" sampling error are confounded in the data—it is not easy to find a procedure which will either completely include both or treat one or the other separately, (2) the survey design and estimation procedure are complex and accordingly require computationally involved techniques for the calculation of variances, and (3) from the survey are coming thousands of statistics, many for subclasses of the population for which there are a small number of cases. Estimates of sampling error are obtained from the sample data and are themselves subject to sampling error which may be large when the number of cases in a cell is small or even occasionally when the number of cases is substantial.

Estimates of approximate sampling variability for selected statistics used in this report are included in the detailed tables. These estimates have been prepared by a replication technique which yields overall variability through observation of variability among random subsamples of the total sample.[24] The method reflects both "pure" sampling variance and a part of the measurement variance.

In accordance with usual practice, the interval estimate for any statistic may be considered the range within one standard error of the tabulated statistic, with 68-percent confidence, or the range within two standard errors of the tabulated statistic, with 95-percent confidence. The latter is used as the level of significance in this report.

An approximation of the standard error of a difference $d = x - y$ of two statistics x and y is given by the formula $S_d = (S_x^2 + S_y^2)^{1/2}$ where S_x and S_y are the sampling errors, respectively of x and y. Of course, where the two groups or measures are positively or negatively correlated, this will give an overestimate or underestimate, respectively, of the actual standard error. These estimates are shown in table II.

Small Numbers

In some tables magnitudes are shown for cells for which the sample size is so small that the sampling error may be several times as great as the statistic itself. Obviously in such instances the statistic has no meaning in itself except to indicate that the true quantity is small. Such numbers, if shown, have been included in the belief that they may help to convey an impression of the overall story of the table.

Table II. Standard errors of estimates for average hearing levels for speech (estimated)[1] and total number of examinees, by selected characteristics: United States, 1966-70

Characteristic	Total number of examinees	Both sexes 12-17 years	Boys							Girls						
			12-17 years	12 years	13 years	14 years	15 years	16 years	17 years	12-17 years	12 years	13 years	14 years	15 years	16 years	17 years
Total number of examinees	....	6,768	3,545	643	626	618	613	556	489	3,223	547	582	586	503	536	489
		Standard error in dB re audiometric zero (ISO-1964)														
Race																
White	5,735	0.15	0.20	0.25	0.30	0.25	0.30	0.45	0.40	0.10	0.25	0.25	0.20	0.20	0.25	0.30
Negro	999	0.25	0.35	0.50	0.65	0.55	0.70	0.70	0.65	0.30	0.55	1.05	0.60	0.60	0.65	0.65
Other races	34	0.65	0.80	39.50	18.15	16.90	3.40	18.45	0.00	1.60	3.60	42.40	42.40	17.15	35.35	28.40
Region																
Northeast	1,641	0.20	0.30	0.35	0.65	0.30	0.85	0.40	0.70	0.25	0.30	0.20	0.35	0.50	0.55	0.60
Midwest	1,757	0.25	0.35	0.50	0.50	0.20	0.35	0.55	0.75	0.20	0.35	0.60	0.30	0.65	0.40	0.30
South	1,704	0.30	0.35	0.50	0.50	0.40	0.25	1.35	0.65	0.35	0.55	0.80	0.65	0.20	0.40	0.55
West	1,666	0.45	0.50	0.90	0.50	0.70	0.60	0.50	0.90	0.40	0.70	0.55	0.35	0.30	0.50	0.50
Urban area																
3 million or more	1,420	0.25	0.35	0.40	0.95	0.45	0.55	0.25	0.45	0.15	0.35	0.65	0.35	0.35	0.45	0.35
1-2.9 million	845	0.45	0.50	0.35	0.65	0.70	0.70	0.65	1.50	0.45	0.85	1.10	0.80	0.75	0.45	0.45
250,000-999,999	782	0.60	0.55	1.10	0.55	0.45	0.65	0.85	1.10	0.90	1.60	1.50	1.20	0.90	0.70	0.65
Under 250,000	540	0.90	0.50	1.95	1.20	1.95	0.70	1.15	5.00	1.45	1.05	2.40	2.25	2.00	1.20	1.85
25,000 or more	293	0.85	1.05	2.55	1.25	0.65	1.90	1.80	0.95	0.65	2.05	0.90	0.75	0.35	0.60	1.10
10,000-24,999	187	1.00	1.25	1.80	1.65	1.95	1.15	2.70	12.45	0.75	1.05	2.35	11.65	17.80	11.70	20.10
2,500-9,999	409	0.25	0.40	0.95	1.00	0.70	1.35	2.40	0.40	0.20	1.00	0.50	1.20	0.40	1.00	0.50
Rural area	2,292	0.20	0.30	0.45	0.40	0.45	0.35	0.65	0.45	0.20	0.35	0.45	0.40	0.25	0.50	0.45
Income																
Less than $3,000	817	0.25	0.45	0.90	1.10	1.20	0.80	1.40	1.30	0.30	0.90	1.25	1.00	0.80	0.60	0.80
$3,000-$4,999	946	0.35	0.50	0.90	0.95	0.55	0.85	1.00	0.70	0.30	0.50	0.55	0.55	0.60	1.25	0.80
$5,000-$6,999	1,085	0.20	0.30	0.80	0.60	0.60	0.60	0.60	0.65	0.20	0.40	0.65	0.60	0.60	0.65	0.40
$7,000-$9,999	1,555	0.15	0.20	0.40	0.45	0.35	0.30	0.30	0.95	0.20	0.50	0.40	0.35	0.45	0.60	0.45
$10,000-$14,999	1,277	0.20	0.25	0.40	0.60	0.45	0.45	0.50	0.55	0.20	0.45	0.75	0.40	0.35	0.50	0.50
$15,000 or more	652	0.15	0.25	0.45	0.55	0.70	0.80	0.70	0.75	0.25	0.65	0.75	0.85	0.65	0.55	0.65
Education of parent																
Less than 5 years	443	0.50	0.75	1.90	1.35	1.30	1.30	0.85	1.05	0.50	1.95	1.60	1.00	0.80	1.35	2.60
5-7 years	609	0.50	0.60	0.60	1.30	0.55	0.70	2.05	1.25	0.50	0.75	0.75	1.85	0.60	0.50	0.75
8 years	845	0.25	0.40	0.95	0.80	0.80	0.85	0.75	0.60	0.25	0.40	0.45	0.40	0.55	0.55	0.90
9-11 years	1,417	0.20	0.30	0.70	0.55	0.60	0.50	0.65	0.55	0.20	0.45	0.60	0.45	0.95	0.35	0.50
12 years	1,915	0.15	0.20	0.40	0.45	0.30	0.35	0.45	0.80	0.20	0.50	0.40	0.45	0.25	0.65	0.45
13-15 years	554	0.25	0.20	0.55	0.65	0.65	0.70	0.85	0.80	0.30	0.75	1.15	0.55	0.70	0.70	0.60
16 years	443	0.25	0.55	0.65	1.30	0.60	1.00	1.00	1.10	0.20	0.45	0.70	0.95	0.70	1.00	0.65
17 years or more	350	0.25	0.30	0.55	0.75	0.95	0.95	0.80	0.65	0.35	1.20	1.30	1.00	1.15	0.70	0.95
Population change																
Loss	1,601	0.30	0.40	0.60	0.25	0.80	0.65	1.60	0.70	0.25	0.25	0.55	0.55	0.20	0.45	0.60
Below-average gain	1,754	0.30	0.35	0.60	0.55	0.60	0.40	0.50	0.80	0.40	0.75	0.65	0.45	0.70	0.75	0.65
Average gain	1,773	0.30	0.40	0.65	0.75	0.25	0.30	0.30	1.10	0.30	0.35	0.75	0.45	0.65	0.30	0.30
Above-average gain	1,640	0.25	0.35	0.60	0.55	0.40	0.50	0.35	0.80	0.15	0.55	0.50	0.40	0.50	0.40	0.35

[1] Average of hearing levels at 500, 1000 and 2000 Hertz.

APPENDIX II

DEMOGRAPHIC AND SOCIOECONOMIC TERMS

Age.—The age recorded for each youth was the age at last birthday on the date of examination. The age criterion for inclusion in the sample used in this survey was defined in terms of age at time of interview. Since the examination usually took place 2 to 4 weeks after the interview, some of those who were 17 years old at the time of interview became 18 years old by the time of examination. There were 23 such cases. In the adjustment and weighting procedures used to produce national estimates, these 23 were included in the 17 year group.

Race.—Race was recorded as "white," "Negro," or "other." "Other" included American Indians, Chinese, Japanese, and all races other than white or Negro. Mexican persons were included with "white" unless definitely known to be American Indian or of another race. Negroes and persons of mixed Negro and other parentage were recorded as "Negro."

Geographic region.—For purposes of stratification the United States was divided into four geographic regions of approximately equal population. These regions, which correspond closely to those used by the Bureau of the Census, were as follows:

Region	*States Included*
Northeast	Maine, Vermont, New Hampshire, Massachusetts, Connecticut, Rhode Island, New York, New Jersey, and Pennsylvania
Midwest	Ohio, Illinois, Indiana, Michigan, Wisconsin, Minnesota, Iowa, and Missouri
South	Delaware, Maryland, District of Columbia, West Virginia, Virginia, Kentucky, Tennessee, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and Arkansas
West	Washington, Oregon, California, Nevada, New Mexico, Arizona, Texas, Oklahoma, Kansas, Nebraska, North Dakota, South Dakota, Idaho, Utah, Colorado, Montana, Wyoming, Alaska, and Hawaii

Urban-rural.—The definition of urban-rural areas was the same as that used in the 1960 Census. According to this definition, the urban population was comprised of all persons living in (1) places of 2,500 inhabitants or more incorporated as cities, boroughs, villages, and towns (except towns in New England, New York, and Wisconsin); (2) the densely settled urban fringe, whether incorporated or unincorporated, of urbanized areas; (3) towns in New England and townships in New Jersey and Pennsylvania which contained no incorporated municipalities as subdivisions and had either 2,500 inhabitants or more, or a population of 2,500 to 25,000 and a density of 1,500 persons or more per square mile; (4) counties in States other than the New England States, New Jersey, and Pennsylvania that had no incorporated municipalities within their boundaries and had a density of 1,500 persons or more per square mile; and (5) unincorporated places of 2,500 inhabitants or more not included

in any urban fringe. The remaining population was classified as rural.

Urban areas are further classified by population size for places within urbanized areas and other urban places outside urbanized areas.

Family income.—The income recorded was the total income of the past 12 months received by the head of the household and all other household members related to the head by blood, marriage, or adoption. This income was the gross cash income (excluding pay in kind) except in the case of a family with their own farm or business, in which case net income was recorded.

Parent.—A parent was the natural parent or, in the case of adoption, the legal parent of the child.

Guardian.—A guardian was responsible for the care and supervision of the child. He (or she) did not have to be the legal guardian to be considered the guardian for this survey. A guardianship could only exist when the parent(s) of the child did not reside within the sample household.

Head of household.—Only one person in each household was designated as the "head." He (or she) was the person who was regarded as the "head" by the members of the household. In most cases the head was the chief breadwinner of the family although this was not always true. In some cases the head was the parent of the chief earner, or the only adult member of the household.

APPENDIX III
RECORDING FORM

HEALTH EXAMINATION SURVEY—III

AUDIOMETRY

AUDIOMETER NO. (6–9) | EXAMINER (10–11)

USE THIS SECTION WHEN SAMPLE NO. IS EVEN	CARD COL. NOS.	USE THIS SECTION WHEN SAMPLE NO. IS ODD
CPS		CPS
4000: R ☐ ☐ L	(12–15)	4000: R ☐ ☐ L
1000: R ☐ ☐ L	(16–19)	1000: R ☐ ☐ L
6000: R ☐ ☐ L	(20–23)	6000: R ☐ ☐ L
500: R ☐ ☐ L	(24–27)	500: R ☐ ☐ L
2000: R ☐ ☐ L	(28–31)	2000: R ☐ ☐ L
250: R ☐ ☐ L	(32–35)	250: R ☐ ☐ L
4000: R ☐ ☐ L	(36–39)	4000: R ☐ ☐ L
8000: R ☐ ☐ L	(40–43)	8000: R ☐ ☐ L
3000: R ☐ ☐ L	(44–47)	3000: R ☐ ☐ L

CONDITIONS AFFECTING TEST RESULTS: *(Check)*

(48) * ○ ☐ *NONE*

CONDITIONS AFFECTING TEST RESULTS

1 ☐ Cold at present
2 ☐ Ear discharge
3 ☐ Equipment defective*
4 ☐ Cold within past week
5 ☐ Earache within past week
6 ☐ Behavior*
7 ☐ Other*

* *Specify frequency (cps.) if only certain one(s) affected, and describe:* _____

PHS-4611-2
REV. 11-66

SAMPLE NO. (1–5)

○○○

APPENDIX IV

STANDARDS FOR REFERENCE (AUDIOMETRIC) ZERO

The sound pressure standards for "normal" auditory threshold—the 1951 American Standards Association audiometric zero—maintained by the National Bureau of Standards were derived from data of the National Health Survey of 1935-36, as described previously. The original measurements were determinations of voltages applied at the terminals of the audiometer earphones used in the survey for a subgroup of persons with "normal" hearing. These threshold data were transferred by loudness balancing to a group of standard earphones designed especially for stability in calibration—the Western Electric 705-A. After loudness balancing, the earphones were placed on an NBS 9-A standard calibrating coupler and their response was measured.

Later, and in a similar fashion, the National Bureau of Standards transferred the threshold from the Western Electric 705-A earphone to five other types of earphones.

The threshold standards in terms of sound pressure in a standard coupler will be valid for the earphones of these types provided the earphone cushions are of controlled profile, thickness, and compliance; the distance from the front of the face of the moving diaphragm to the plane of the cushion is held constant; and that the earphone is held against the ear with a constant coupling force.[13,23] They will not apply to earphones of other types.

The transfer characteristics for the TDH-39 earphones MX-41/AR cushions used in this survey were those determined for the Health Examination Survey instruments at the University of Pittsburgh to replace those previously suggested by Allison Laboratories.[25]

The new (1964) standard reference zero recommended by the International Organization for Standardization (ISO)[10,26-29] was adopted in the 1969 American National Standard for audiometers during conduct of this survey to replace the differing 1951 American and the 1954 British Standards.[30] Since these new standards are appearing in many of the journals and other technical publications, the comparison of them with the 1951 American Standard on the 705 A earphones and the TDH-39 earphones used in this survey is shown in table III.

The thresholds for the 1951 American Standard and the recommended ISO Standard on the 705-A earphones are rounded to the nearest 0.5 dB in accordance with the ISO method of presentation. The TDH-39 thresholds are retained in the form used to convert the findings from this survey to decibels re 0.0002 dyne per square centimeter, as shown in the section "Comparison With Previous Findings."

Table III. Comparison of 1951 American Standard and the recommended ISO Standard for reference zero

Frequency	1951 American Standard for reference zero of:		Recommended ISO Standard for reference zero of WE-705-A earphones[1]
	WE-705-A earphones[1]	TDH-39 earphones[1]	
	Decibels re 0.0002 dynes per square cm.		
250 cps . . .	39.6	45.4	24.5
500 cps . . .	25.0	30.0	11.0
1000 cps . . .	16.5	22.6	6.5
2000 cps . . .	17.0	21.8	8.5
3000 cps . . .	[2]16.0	26.7	7.5
4000 cps . . .	15.0	28.9	9.0
6000 cps . . .	[2]17.5	23.9	8.0
8000 cps . . .	20.9	26.5	9.5

[1]On NBS 9-A coupler. TDH-39 earphone reference values shown here are those determined for the Health Examination Survey instruments at the University of Pittsburgh.[14] The other two sets were determined by averaging many different determinations from many different countries, available from the National Bureau of Standards.

[2]Estimated.

OUTLINE OF REPORT SERIES FOR VITAL AND HEALTH STATISTICS

Originally Public Health Service Publication No. 1000

Series 1. Programs and collection procedures.—Reports which describe the general programs of the National Center for Health Statistics and its offices and divisions, data collection methods used, definitions, and other material necessary for understanding the data.

Series 2. Data evaluation and methods research.—Studies of new statistical methodology including: experimental tests of new survey methods, studies of vital statistics collection methods, new analytical techniques, objective evaluations of reliability of collected data, contributions to statistical theory.

Series 3. Analytical studies.—Reports presenting analytical or interpretive studies based on vital and health statistics, carrying the analysis further than the expository types of reports in the other series.

Series 4. Documents and committee reports.—Final reports of major committees concerned with vital and health statistics, and documents such as recommended model vital registration laws and revised birth and death certificates.

Series 10. Data from the Health Interview Survey.—Statistics on illness, accidental injuries, disability, use of hospital, medical, dental, and other services, and other health-related topics, based on data collected in a continuing national household interview survey.

Series 11. Data from the Health Examination Survey.—Data from direct examination, testing, and measurement of national samples of the population provide the basis for two types of reports: (1) estimates of the medically defined prevalence of specific diseases in the United States and the distributions of the population with respect to physical, physiological, and psychological characteristics; and (2) analysis of relationships among the various measurements without reference to an explicit finite universe of persons.

Series 12. Data from the Institutional Population Surveys.—Statistics relating to the health characteristics of persons in institutions, and on medical, nursing, and personal care received, based on national samples of establishments providing these services and samples of the residents or patients.

Series 13. Data from the Hospital Discharge Survey.—Statistics relating to discharged patients in short-stay hospitals, based on a sample of patient records in a national sample of hospitals.

Series 14. Data on health resources: manpower and facilities.—Statistics on the numbers, geographic distribution, and characteristics of health resources including physicians, dentists, nurses, other health manpower occupations, hospitals, nursing homes, and outpatient and other inpatient facilities.

Series 20. Data on mortality.—Various statistics on mortality other than as included in annual or monthly reports—special analyses by cause of death, age, and other demographic variables, also geographic and time series analyses.

Series 21. Data on natality, marriage, and divorce.—Various statistics on natality, marriage, and divorce other than as included in annual or monthly reports—special analyses by demographic variables, also geographic and time series analyses, studies of fertility.

Series 22. Data from the National Natality and Mortality Surveys.—Statistics on characteristics of births and deaths not available from the vital records, based on sample surveys stemming from these records, including such topics as mortality by socioeconomic class, medical experience in the last year of life, characteristics of pregnancy, etc.

For a list of titles of reports published in these series, write to:

Office of Information
National Center for Health Statistics
Public Health Service, HRA
Rockville, Md. 20852